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# Engineering at the British Empire Exhibition

**By I. William Chubb**

Editor, European Edition, *American Machinist*

## Some statistics of the size and cost of buildings and exhibits—An outline of the exhibits shown at such booths as Vickers, Beardmore and Armstrong-Whitworth

"DESIGNED to display the natural resources of the various countries within the Empire, and the activities, industrial and social, of their peoples," to use an official phrase, the British Empire Exhibition being held until October at Wembley, just outside the northwest corner of London, has cost the exhibition authorities something like 12 million pounds, while the value of the exhibits is of about an equal amount, and the amusement park, it is understood, has cost another million and three quarters.

Photo by Campbell-Gray

*Fig. 3—A reproduction of Old London Bridge*

A considerable number of the buildings are permanent, ferro-concrete being employed. Thus the stadium, the largest sports arena, it is thought, in existence, will accommodate about one-eighth of a million onlookers, being 1½ times the size of the Coliseum, Rome. Then the Palace of Engineering, understood to be the largest ferro-concrete building in the world, measures 950 ft. by 755 ft., while the Palace of Industry, Fig. 1, is only slightly smaller. The Palace of Art has an area of about 40,000 sq.ft. and with the exception of Southern Ireland, all the Dominions, Colonies, etc., that are associated with Great Britain have appropriate pavilions, the section (about 6,000 sq.ft.) specially devoted to Ulster really forming part of the Palace of

Photos by Campbell-Gray

*Fig. 1—The Palace of Industry. Fig. 2—The Palace of Engineering*

Photo by Campbell-Gray

*Fig. 4—The British Government Building*

Industry. Fig. 3 shows the entrance to old London Bridge, reproduced with shops, cobble stones, etc., leading to the pavilion in ferro-concrete associated with the British Government, Fig. 4, the columns of which, to give an idea of the scale, are 32 ft. high, while the lions at the entrance, to borrow the publicity man's phrase, "reduce those round Nelson's column to mere kittens."

In this building various government departments offer suggestions as to some of the national work they undertake. The Royal Society shows recent progress in pure science, the Imperial Institute shows how it promotes the use of Empire raw material, the National Savings Committee illustrates its work, the War Office, the Air Ministry and the Admiralty are all represented, and, to name nothing else, the Meteorological Office gives demonstrations in forecasting the weather and the exploration of the air.

### Power Generation Equipment

The generation of the electrical energy needed for lighting and power purposes in and about the exhibition forms one of the chief exhibits, alternating-current plant, including boiler house, etc., being installed in the Palace of Engineering. The supply, in fact, is obtained from three different sources, including this steam generting station in the engineering section, a transformer substation in the Palace of Industry which obtains a supply from outside, and a direct-current supply provided by machines on a number of the stands. The generating station in the Palace of Engineering itself will be seen in Fig. 5.

For the engineering and industrial exhibits generally the method has been followed of organizing the stands through the trade associations. Thus the shipbuilding, marine, mechanical and general engineering exhibits have been arranged by the British Engineers' Association, Inc., the electrical and allied engineering exhibits by the British Electrical and Allied Manufacturers' Association, Inc., the motors and cycles by the Society of Motor Manufacturers, Ltd., and the British Cycle and Motor Cycle Manufacturers' and Traders' Union, Ltd., and a combined exhibit is made by the Papermakers' Association for Great Britain and Ireland, Inc., textile machinery being similarly segregated. Woolen and lace articles are organized in the same way, and so on through the whole range of industries.

Photo by Campbell-Gray

*Fig. 5—Power plant in the Palace of Engineering*

The general engineering section, a portion of which is shown in Fig. 6, is formed by the products of 300 or more firms, and the electrical section by more than 200

Photo by Campbell-Gray

*Fig. 6—A view in the general engineering section*

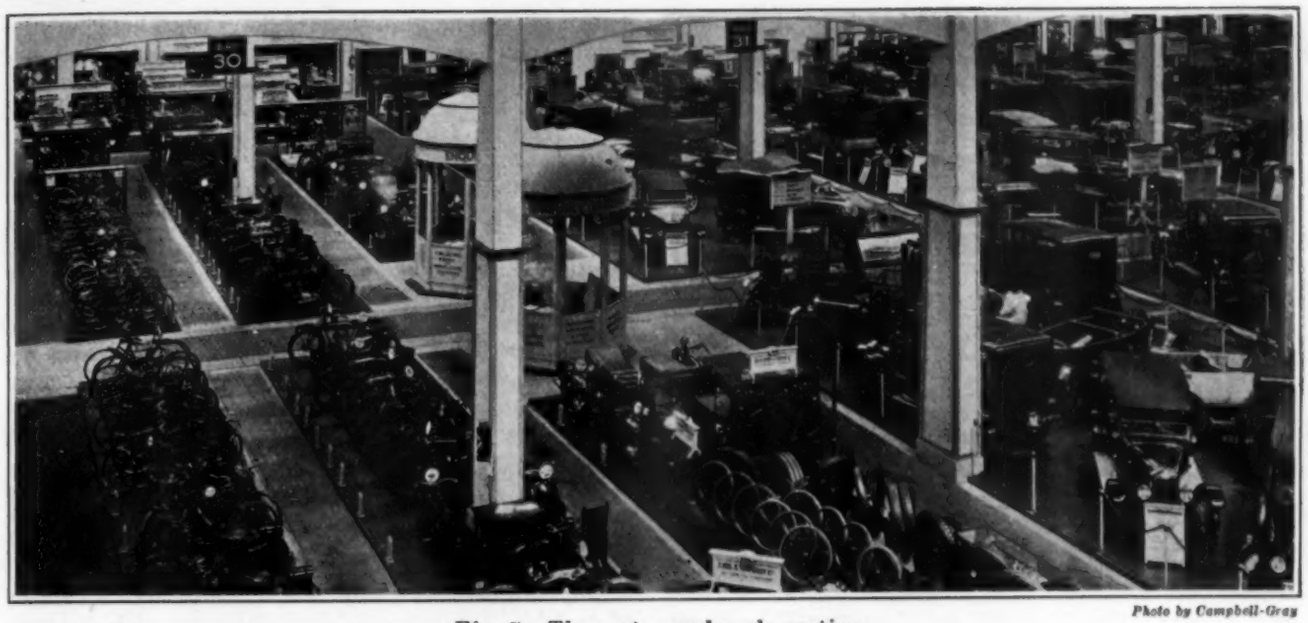


Photo by Campbell-Gray

*Fig. 7—The motor and cycle section*

firms. The motor and cycle section, Fig. 7, covers 50,000 sq.ft. and in it also are concerned some 200 firms. In general, the exhibits represent, and are intended to represent, standard practice, few innovations being displayed. The vast collection represents the technical ability rather than, unfortunately, the present economic condition of this important branch of British industry. Few divisions are unrepresented, but the machine tool section is only just redeemed from insignificance. The attitude of the trade association is well known. It has its own stand, at which photographs may be seen and lists consulted, its contribution to the exhibition being a lathe made by Henry Maudslay in or about 1800, with triangular bar bed about 3 ft. long. The engineering relics to be seen at Wembley also include a locomotive which was driven by George Stephenson to draw the first passenger train to run in the world.

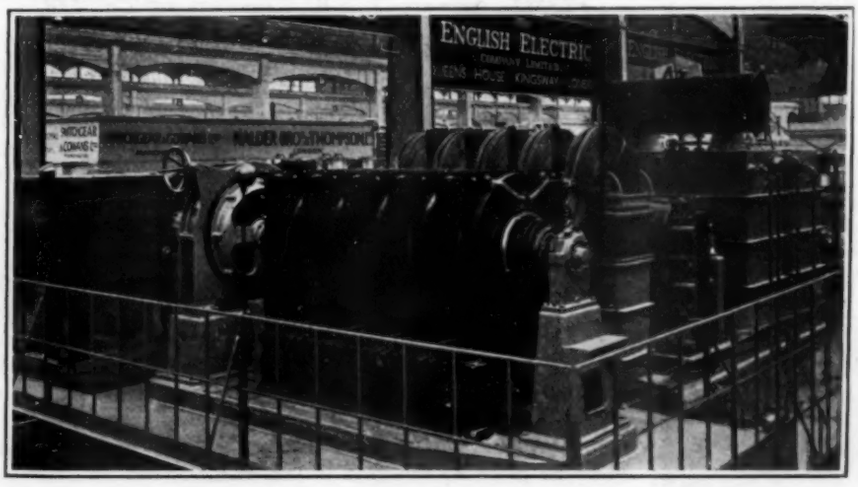



*Fig. 8—English Electric Co.'s Transverter*

Most electrical engineers in Great Britain regard the transverter, Fig. 8, on the stand of the English Electric Co., Ltd., as the outstanding electrical exhibit. Its main purpose is to permit the use of direct current for transmission purposes, while retaining the alternator as generator. It is completely reversible. It will take alternating current of any kind and convert it into direct current at high pressure, while a similar machine at the receiving end will convert the direct current into alternating current at any desired pressure. It can also be arranged to change direct current from one voltage to another. The machine exhibited, the first of its kind, has input at 6,600 volts, 3-phase, 50 cycles, and an output of 2,000 kw. at 100,000 volts, direct current. For the most part the machine is static, the only moving details being the rotating brush arms, which are driven by a small motor. The machine is really a combination of static transformer and rotary converter.

The vast nature of the engineering exhibits prevents any attempt to deal with them other than by way of samples. For this reason one or two of the largest stands are picked out for attention. Thus the exhibits of Vickers, Ltd., have at least as wide a range as those of any other firm taking part, and include a comprehensive collection to illustrate part of the work of the firm's research laboratories. There are also a 16-in. naval gun (wooden body) with breech mechanism in operation, an 8-in. howitzer, an 18-pounder field gun, a 3-pounder semi-automatic gun, and 2-pounder, 1½-pounder and 1-pounder automatic guns and a 5-in. aircraft gun, besides others. The machine tool section, referred to later, is illustrated in Fig. 9, where will be seen adjustable reamers, quick-change drill chucks, milling cutters, etc., produced in the firm's works. Old locomotive crankshafts are exhibited, one of which has been in use for 35 years, and many stainless steel products are displayed. The gearing shown includes a double-helical example which transmits 4,600 hp., the wheel center being of cast iron on which is shrunk a forged steel rim with a tensile strength of 34 tons per sq.in., held also in position by threaded steel pins. Two-stroke valveless

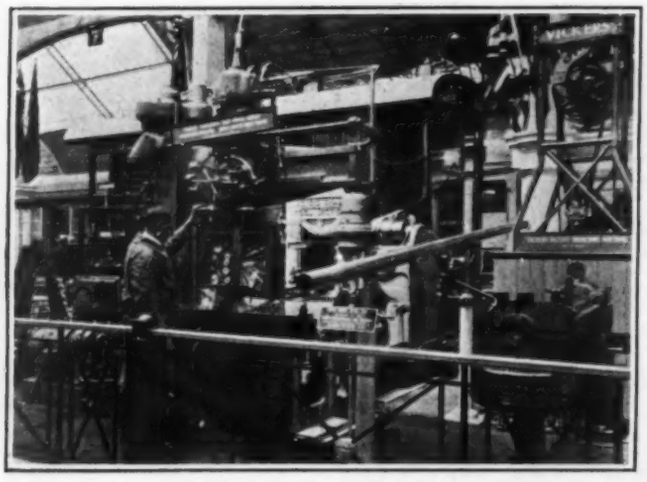


*Fig. 9—Part of the stand of Vickers, Ltd.*

heavy oil engines of various sizes are exhibited both in marine and land types, a number of models of ships of various kinds, floating docks and aircraft will be found, and a considerable amount of auxiliary machinery for ships, a new pump being exhibited in which the water is propelled by screw thread. These are only a few of the items exhibited.

To give an idea of the products of their several shipyards, works, etc., in the Newcastle and Manchester districts, Armstrong, Whitworth & Co., Ltd., occupy a large stand, and in mechanical engineering show a range extending from a main line locomotive to small tools. Fig. 10 illustrates rather less than a quarter of the complete stand. The locomotive is one of a number built for the Buenos Aires Great Southern Railway, with engine weighing 84½ (English) tons, and a tender in working order of 49 tons, the total length being 64 ft. 5 in., and the boiler pressure 200 lb. per sq.in.

### Airplanes and Engines

Passing over a 10-ton steam road roller with locomotive-type boiler having a Belpaire firebox and two-cylinder piston-valve compound engine, drying and mixing plant for the manufacture of tar macadam and asphalt, four-stroke and two-stroke paraffin engine electric lighting sets of 1½-kw. capacity, a Pelton wheel (shown by a one-third size model) to develop 7,500 b.hp. at 428 r.p.m. under a head of 850 to 1,150 ft., we may refer to the Jaguar aero engine having 14 radial cylinders, air-cooled, the guarantee including 350 b.hp. at 1,600 r.p.m. with a petrol consumption of 0.312 liters and an oil consumption of 0.017 liters per b.hp.-hour, the weight complete being 760 lb. A 7-cylinder radial air-cooled engine of much the same type is also exhibited, and the stand includes the Siskin single-seater fighting aeroplane with Jaguar engine, the span being 28 ft. 4 in. by 21 ft. 6 in. long, the height 9 ft. 6 in., and the surface of the main planes 253 sq.ft., the maximum weight fully loaded 2,250 lb., the load per hp. being 6.5 lb. Steel tube is used for the fuselage, braced with tie rods, no welding being employed in the frame. The interplane struts are of steel, while the wings are of wood with hollow spars. For the lower plane the bracing provides that the load of any wire, if broken, can be taken by two other wires, and a wing strut can be shot away without the aeroplane collapsing in flight, each plane having independent bracing. Two guns can be carried directly over the steel tube longerons, while an additional gun, if required, can be carried on the top plane and can be fired in any position from a few degrees from the horizontal upward. About 2,000 rounds of small arms ammunition are carried.

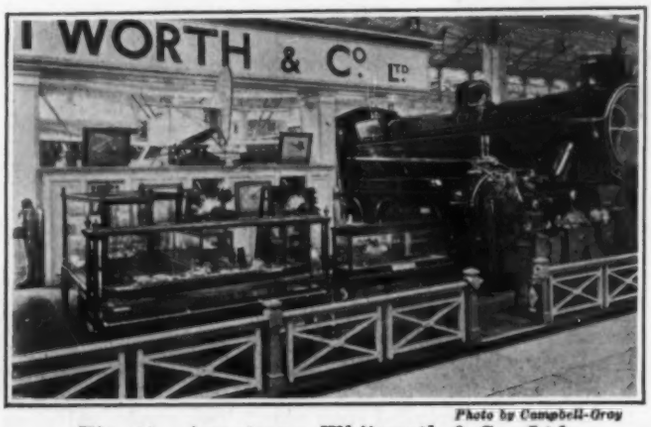



Photo by Campbell-Gray

*Fig. 10—Armstrong, Whitworth & Co., Ltd.*

Shipyard exhibits are mainly in the form of a number of models. These include an ice-breaker with displacement in working condition of 2,175 tons, the stem being cut away so that the ship can mount the ice and break it by weight, and the work is facilitated by the use of a forward propeller. Another model shows the R.33 rigid airship, which has a total length of 640¼ ft., a diameter of 78¾ ft., its lifting power being divided between 19 separate gas bags, giving a gross lift of about 58 tons, the weight of the structure being 33 tons.

*Fig. 11—The stand of W. Beardmore & Co., Ltd.*

Among ordnance exhibits is the first gun made by the firm, a 3-pounder produced in July, 1855, the steel barrel having coiled iron cylinders shrunk one above another, the gun being rifled and breech-loading, with a movable vent piece. Swashplate engines shown are used under hydraulic pressure in gun mountings for gun training and operating purposes, the reciprocating motion of pistons being converted to rotary motion by a circular plate set oblique to the axis of rotation. With oil, the device is used as a variable-speed gear. Among smaller matters note may be made of pneumatic tools, and of the method here in the drills of attaching the big end of the connecting rod to the crankshaft by wrapping springs round half collars on the bearings.

The steel exhibits include a turbine rotor forging weighing 12 tons, and Vibrac material, which is being used as centers for large inserted-tooth cutters. The material will give a tensile strength of more than 100 tons per sq.in., with an elongation of 10.5 per cent, a

reduction of 35 per cent and an impact figure of 12 ft.-lb.; or with a tensile strength of 60 tons the elongation may be 19.5 per cent, with 58 per cent reduction and an impact figure of 66 ft.-lb. Stainless and rustless steel articles include a Pelton wheel bucket and from the firm's research department is a dilatometer for determining the critical points during the heat treatment of steel. Vibrac steel drop stampings are shown, the material being free from temper brittleness or "Krupp krankheit," after the heat treatment. Reference is made elsewhere to the machine tool and small tool exhibits.

The stand of W. Beardmore & Co., Ltd., measuring 88 ft. by 62 ft., shows the products of eight different works, Parkhead being represented largely by models of steel castings, Fig. 11, the originals being too massive for exhibition purposes. The rudder frame of the "Hood," for example, is shown by a model, the original weighing more than 50 tons. A propeller shaft bracket for the same vessel is similarly shown, the rudder of one of the Canadian Pacific vessels, etc. The armor plate rolling mills are represented by a plate weighing about 16 tons, with an armored tube of about 5 tons in weight and 4 in. thick. Included in the ordnance exhibits is a 15-in. inner A tube weighing 12 tons 7 cwt., a 40-mm. field gun equipment, etc. A new 800-b.hp. aero engine and a steam turbine 12 ft. by 8 ft. weighing 15 tons for marine purposes may be noted, while perhaps the largest exhibit on the stand is a 4-6-0 locomotive for one of the British railways. Models of ships are shown, and a suite of rooms represents the staterooms of a first-class ocean-going liner. A model of the R.34 airship which flew across the Atlantic and back in 1919 is included, together with a considerable number of smaller exhibits such as curb petrol dispensing pumps and pumps of other types.

*(To be concluded)*

## Getting the Best Men in the Machine Business—Discussion

By Wm. Newman

I wish to congratulate John R. Godfrey for stating some truths in his article on page 781, Vol. 60, of the *American Machinist*, under the title given above. But why not come out boldly and say the machinist is the poorest paid animal that works his hands in conjunction with the head for his employer? Why stop at the comparison with the plasterer at $13 a day when the bricklayer gets $1.50 per hr., the carpenter $1.25, the painter $1.15 or thereabouts, the structural iron worker $1.15 or so, the paper hanger $10 to $14 a day, the plumber's helper $0.90 per hr., the hod carrier $0.90 per hr., the laundry wagon driver $40 to $75 per week?

The building tradesman does not pay more than $25 or $30 for a kit of tools and seldom works closer than ½ in., while the machinist, if he is a good all-around man is offered the large sum of $0.71 per hr. and pays $150 for a small kit of tools. He works to narrow limits, 0.003 in. being a great allowance and as close as 0.0003 in. in many, many instances and no job is supposed to be too big for him. He never gets the trade thoroughly learned and when he has spent the best years of his life at it and gets gray headed he is edged toward the door. The machinist works in poorly lighted, poorly ventilated shops, with closely grouped machines, dirty, greasy floors, strewn all over with castings, forgings, etc., and in a great many cases under very inefficient management. He is expected to be efficient, happy and contented when his pay envelope does not contain half what other skilled workmen receive.

Then the management takes any Tom, Dick or Harry and puts him over certain machines on piece work and he knocks out $1 or more per hr., after a short experience, while the man who makes this possible gets $0.71 if he is a good, obedient servant and makes and keeps the tools in shape as well as the machinery. What incentive is there for a young man to learn the trade when it takes two hours of his work to hire a bricklayer? How can he ever hope to own a home when he has to pay such prices for other labor necessary in its construction, let alone the price of the material and the land? I know first-class machinists who have left the trade to take up the pick and shovel and get $0.70 to $0.75 per hr., and have laid down the micrometer and the try-square and its responsibilities. Of course the man who makes, builds and repairs tools and machine tools is not entitled to a fair rate of wages as he is considered a non-producer, so it is given to the farmer boy or the city chap on the screw machine or turret lathe or other special machinery, but if any thing happens to the machine it is up to the machinist to get things going. It is not a matter of dirty hands that causes a lack of apprentices but a matter of long green. Why spend years learning the trade when there is a shorter route to the long green end?

## Reducing the Fire Hazard in Handling Magnesium

By Henry C. Francis

With the increasing use of magnesium for motor pistons and other parts, it is well to understand to just what extent the metal is a fire hazard in the shop. The use of the metal as a flash powder in photography and for pyrotechnics, naturally leads one to believe that it is dangerous. In fact, however, magnesium must be heated to approximately 1,000 deg. F. before it will burn and then the whole mass must be raised to this temperature.

This fact, it will be seen, confines the danger to small masses of magnesium such as fine chips or shavings. A piece of fine magnesium wire or ribbon is easily ignited. In a similar way a steel wire 0.001 in. in diameter will burn if heated with a match, but more slowly. And we know how filings of iron or steel will give a good representation of the Fourth of July if sprinkled into an open flame.

On account of the possible danger it is advisable to prevent an accumulation of chips in the open air. A can with a wide, funnel-shaped mouth and a small opening into the can itself, makes a good safeguard. Have this can emptied as often as convenient into a larger closed metal container that is kept in a dry and fire proof portion of the plant. Buckets of sand should also be kept available in place of the usual fire extinguishers, as water or chemicals accelerate the combustion of magnesium. After a fire starts in magnesium, it must be smothered by cutting off the supply of air. As the spread of the fire is slow at first there is ample time to empty a bucket of sand on the burning magnesium and smother the flame.

# Good and Bad Things in the Railroad Shop

By D. B. Wedge

THERE is a lot of misinformation going the rounds concerning the railroad shops of the country. It is for the most part prejudiced on one side or the other. Some railroad-shop men, especially executives, contend that the railroad shop is as well equipped and as efficiently run as a contract or other shop of the same size. Contract shop men find fault with everything the railroad shop does and frequently compare it with the navy yards. Both views are extreme and neither does any good.

I was brought up in a railroad shop, then I went out into the world and worked in all sorts of private shops, the work varying from that in job shops in small towns to the building of automobiles in large quantities. Now I'm back railroading again and I believe I have a better and more balanced view of the situation than is possible without some such experience. I know both sides of the game and I'm sure I can point out the good and bad spots better than a man who has only worked on one side or the other.

There are two things to consider in any kind of a shop—the men and the equipment, and in some cases the men are affected by the kind of equipment they have to use.

My greatest criticism of the men is that they are apt to be in-bred, that is, without other experience, which is responsible for the prevailing belief that railroad work is "different" from any other. True it has its peculiarities, but cutting tools act in the same way on similar material, and shops without cranes waste time in handling material whether they repair or build locomotives or other machinery. If railroad-shop executives and men would visit other kinds of shops and see how work is handled in them, it would pay big dividends to the railroads.

### The Why of Home-Made Machines

On the other hand the railroad-shop executive has a splendid alibi in most cases. He has tried for years to get decent machines in the shop, only to have his requisition ignored, if not refused. He has had to fudge up home-made bulldozers, boring mills, link grinders and other tools until he has come to believe that maybe they are as good as the regularly-made machines for their purposes. They haven't cost anything—the way he figures it—and the "higher-up" points with pride to the low shop-expense for new equipment. But if the maintenance account was carefully analyzed it would show home-made machines and tools that probably cost double the price of new ones.

Every once in a while some bright shop foreman has to have a milling cutter and knows he can't get it past the P.A. So he makes it out of an old axle, casehardens it and manages to get his work done by nursing the cutter on the job. Then some one gets the idea that the shop has saved money and boosts the casehardened cutter. This epidemic comes around periodically, like measles in the country school.

As a matter of fact, however, the casehardened cutter costs a lot of money in comparison with the modern, high-speed cutter, if you count the machine-hour value of the machine on which it is used. For any production man knows that the cost of a cutter is a small item as compared with the cost of a high-priced machine, when the cutter is nibbling away instead of taking a real cut.

I fully appreciate the railroad man's point of view—and considering the handicaps he has worked under, he has done remarkably well. Nor is he to be blamed if he fails at times to enthuse over new ideas and new methods. His ambition to do better work and get better tools has been thwarted so often by the man with the check book, that it is small wonder he loses vim and pep and is content to let things slide along in the easiest way. And even when his requisition has been allowed, the P.A. has handed him some just-as-good machine that didn't fill the bill, and for that reason many railroad-shop executives rival the stoics of old in making the best of things as they come.

I believe there's a new day coming—that's the reason I'm back in the game.

## Erratum

Otto Feeg, chief engineer of the Ersten Brünner Engineering Co., has asked us to publish the following letter. He says, "In regard to the article 'The Cost of Nationalism in Czecho-Slovakia,' published in the *American Machinist*, page 291, Vol. 60, I would like to see the following corrections made:

"It is not true that I informed the two authors that a high official would be punished severely if he accepted a bid of a German manufacturer even if the bid was made entirely on the basis of quality and price. Such a condition is entirely unknown to me.

"It is also untrue that I have made any kind of accusations against the government of the Czecho-Slovakian Republic and it is not probable that I have said that German manufacturers would not get any orders in this country. To the contrary I already knew at the time of the authors' visit, that a German concern had obtained a large order for military equipment.

"It is true that the technical data concerning the Ersten Brünner Enginering Co. came from me although they were incomplete and insufficient. My name was not mentioned in that connection, however.

"It is most likely that the authors confused me with some other informant and I trust you will print this correction since it is of importance to me."

## Three-Cylinder Simple Locomotive

The demand for greater tractive power without increasing axle loads led the American Locomotive Co., to design and build a three-cylinder locomotive which has been in service for nearly two years. The third cylinder drives the second pair of driving wheels by means of a cranked axle and trains are started more easily as well as being hauled more economically due to the shorter cutoff being possible. The dynamic effect on the track is also less than with the two-cylinder locomotive.

The cranked axle is of the built up type, carbon-vanadium steel being used. Grease lubrication is applied to the crankpin through the center of the axle by grease plugs at the outer ends. The crank-axle driving box has supplementary bearings on each side of the axle below the usual crown brass. The bearings are from 2½ to 3 in. wide and are adjustable. There is also a spreader between the lower ends of the driving box to prevent them from closing in.

# Rebuilding Narrow-Gage Locomotives

**By Howard Campbell**
Western Editor, *American Machinist*

## Machining repair parts for "mud-hens"—Motive power for narrow-gage lines kept in good condition — Details as to tools and methods used

ALTHOUGH practically all of the old narrow-gage railways that were laid across the mountain passes when the West was young have given way to the modern standard gage, there are still two or three lines that have not been converted. The Denver & Rio Grande Western operates a narrow-gage line down through the San Luis valley from Salida to Santa Fe, with shops at Alamosa, Colo. Some of the more interesting operations in the machining of the small parts for the engines used on this road are described herewith.

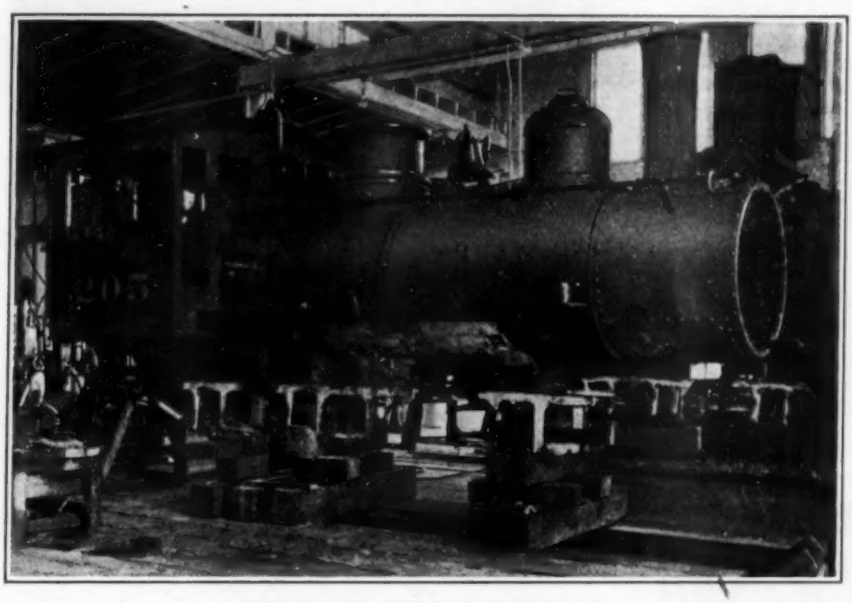


*Fig. 1—A "mud-hen" blocked up for repairs*

The locomotives are much smaller than the usual standard gage types, and in many cases the driving wheels are inside the frame—a type that is commonly known as a "mud-hen." An idea of the size of the engines can be formed by reference to Fig. 1, which shows a locomotive of this type blocked up for major repairs.

The saddle of a narrow-gage engine is shown in Fig. 2, with a cylinder head in position for "grinding-in" to one of the cylinders. No gaskets are used under the cylinder heads, each being ground in to a steam-tight fit by the use of the apparatus shown in Fig. 3. This consists of an air-motor connected to a rod that is attached to an air-pump piston. A vertical bar is bolted to the piston near the periphery, and is also connected to a bar that is bolted to the cylinder head as shown. Pressure on the head is obtained by means of a heavy spring on the rod that holds the head in place, as shown in Fig. 2. The desired amount of tension can be obtained by turning the nut on the threaded end of the rod. When the air is turned on, the air-pump cylinder acts as an eccentric and carries the beam up and down, imparting an oscillating motion to the cylinder head. Abrasive and oil are used to grind the seat, a compound known as "Zip" being used at the finish. A steam-tight joint can be produced in from 2 to 2½ hours.

The small size of the locomotive driving wheels is evident in Fig. 4. The operation is that of boring the crank-pin holes, one of which, in this case, was trued to a 3-in. and the other to a 3¼-in. diameter. The holes were 5¾ in. long. Approximately $\frac{1}{16}$ in. of stock was removed and the inside ends of the holes were countersunk at an angle of 45 deg. to a

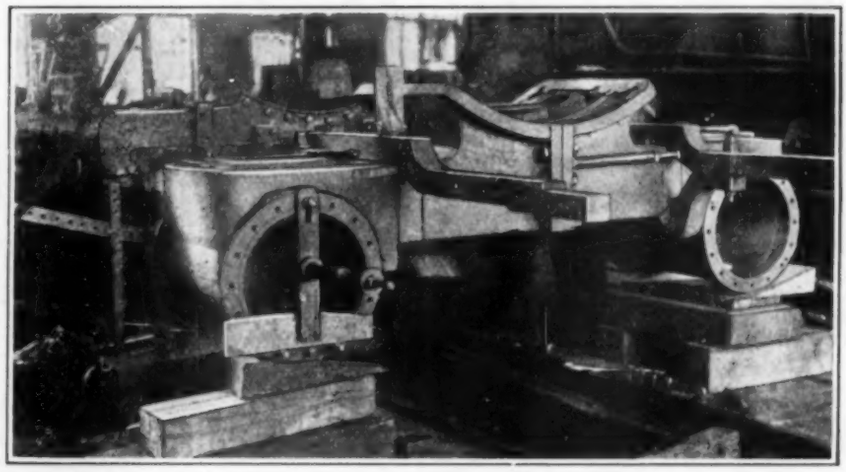


*Fig. 2—Saddle of narrow-gage engine*

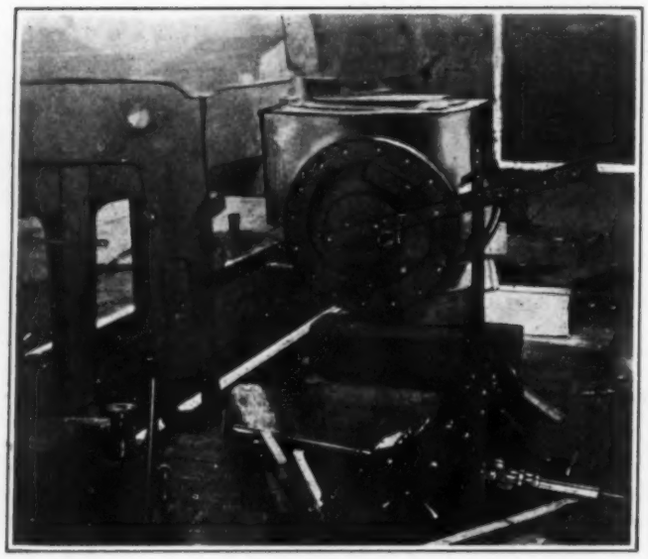


*Fig. 3—"Grinding-in" a cylinder head*

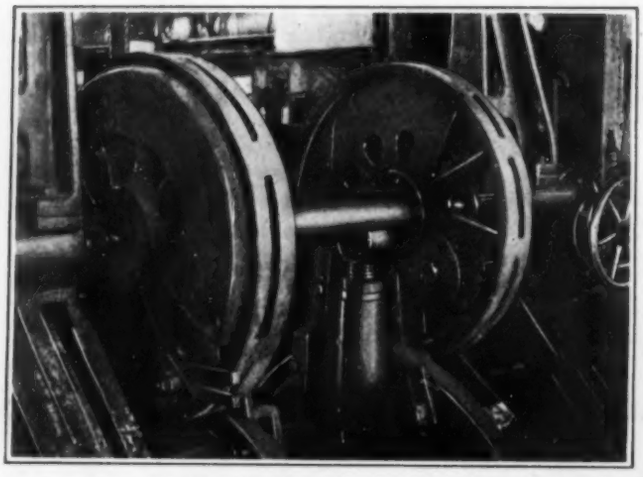


*Fig. 4—Boring crank-pin holes*

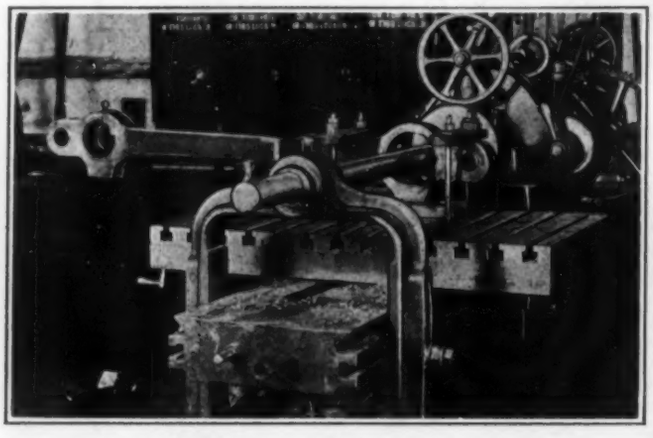


*Fig. 5—Main rod set up for boring*

depth of approximately $\frac{1}{2}$ in. Pins were turned to fit.

The operation of turning wheel centers is performed on a 90-in. motor-driven wheel lathe. The time required for a pair of centers 37 in. in diameter is $1\frac{1}{2}$ hr. With the old machine the time required for a pair of centers of the same diameter was 4 hours.

A forged main rod that has been set up for boring on a Sellers horizontal boring machine is illustrated in Fig. 5. All rods, both old and new, are bored on this machine, although the rod shown is to be just "cleaned up." A new bushing will be made to fit the hole. The hole can be trued in a rod of this type in approximately 25 minutes.

The journal brasses are only $7\frac{1}{4}$ in. in diameter, across the ends of the flanges, and are small enough to be turned in the lathe shown in Fig. 6. The brass is locked between the flanges of the arbor by tightening the nut on the arbor and the three setscrews in the loose flange. Thus the brass is locked between the

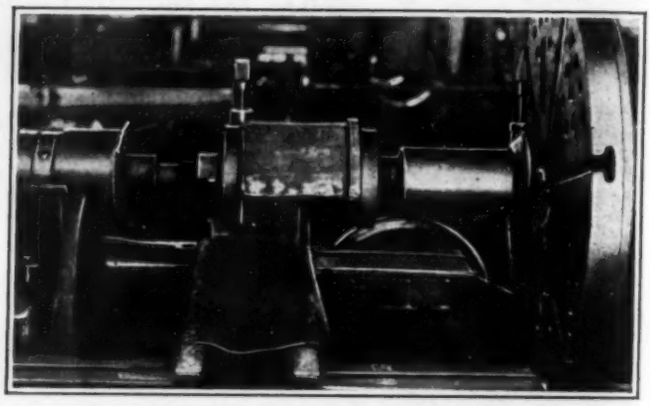


*Fig. 6—Journal brass for a "mud-hen"*

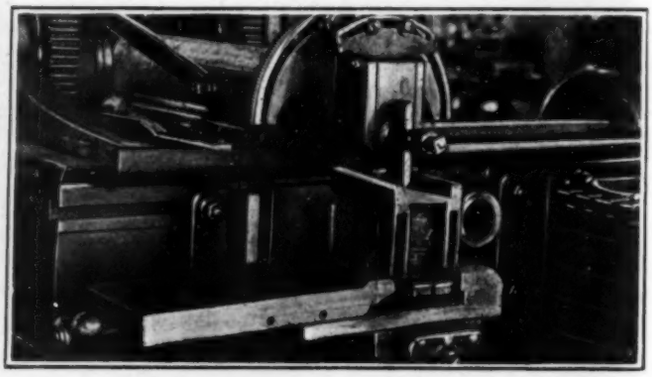


*Fig. 7—Machining a driving box*

*Fig. 8—Machining a pedestal binder*

*Fig. 9—Planing a crosshead*

setscrew points and corresponding points in the solid flange at the head-end of the arbor. The stock varies from $\frac{1}{16}$ in. at the center of the casting to $\frac{1}{8}$ in. at the edges and is taken off in two cuts. All but about $\frac{1}{16}$ in. is taken off in the first cut, the work revolving at a speed of 72 r.p.m. for the first cut and 120 r.p.m. for the second cut. A piece is turned complete in approximately 15 minutes.

An engine-truck driving box is set up in the machine shown in Fig. 7. The box is a steel casting and has approximately $\frac{1}{8}$ in. of stock on a side to be removed, each side being finished in one cut. The width is $5\frac{31}{32}$ in., side to side, and the time required for machining is one hour.

### A Shaping Job

The operator shown in Fig. 8 is shaping out a slot in a pedestal binder for a narrow-gage engine, using a Cincinnati shaper for the job. The piece is a forging and when finished will be 26 in. long, all other dimensions being in proportion. A binder can be machined complete in approximately 40 minutes.

The operation of planing for the babbitt lining in a crosshead is shown in Fig. 9. The machine is a Gray planer and the tool, which on this operation is fed by hand, is $\frac{3}{4}$x1$\frac{3}{4}$ in. high-speed steel. The finish dimension is $3\frac{29}{32}$ in., and the job is completed in approximately 2 hours.

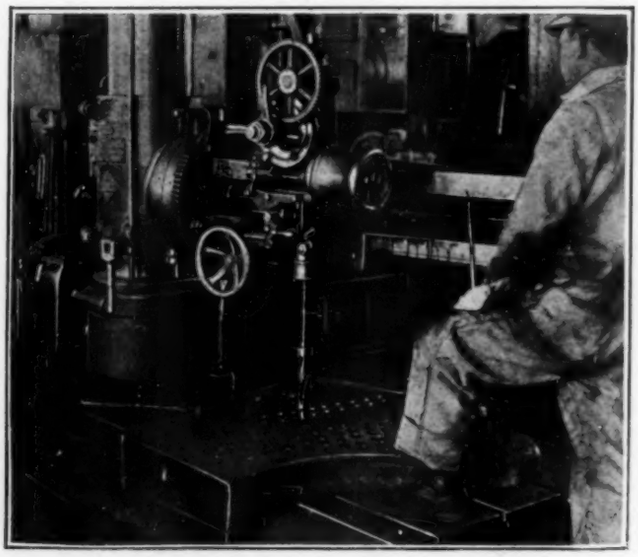


*Fig. 10—Reaming flue holes in front flue sheet*

The operator shown in Fig. 10 is reaming out the holes for standard 2-in. flues in a front flue sheet. The 151 flue-holes are drilled $1\frac{1}{4}$ in., then the flue holes are reamed to 2 in., a three-lipped drill being used for the job. A row of $\frac{13}{16}$-in. holes, for $\frac{3}{4}$-in. rivets, are also drilled around the edge of the flange. Black oil is used as a lubricant and the job is completed in approximately 4 hours.

## Metal Straps for Boxes

The use of metal box strapping is no longer considered an additional shipping-room expense, says J. F. Keeley, packing expert of the Department of Commerce. Exhaustive tests have proved that the metal strap pays for itself from the start by making it possible to use thinner boards in making boxes, saving shipping weight as well as lumber, to say nothing of decreasing pilferage losses and other shipping hazards. Sides, tops, and bottoms of boxes may be reduced in thickness by as much as $\frac{3}{8}$ in. if enough straps are used and the box will be stronger than the unstrapped box of thicker boards. Railways, express companies and shippers have confirmed one another's testimony that losses in transit have been materially lessened in the past two or three years by increased use of straps, insuring safe delivery.

The Department of Commerce not only advocates the use of metal box strapping whenever possible, but it hopes to extend that use by disseminating the following rules, compiled by the Forest Products Laboratory at Madison, Wisconsin:

Nailless strappings.—Only unannealed straps should be used. Material wider than $\frac{3}{4}$ in. or thicker than 0.023 in. is not ordinarly used. It is suggested that one or two straps be used on all sizes of boxes of the ordinary proportions and weights. Three straps should be used on relatively long or heavy boxes. The same total strength of strapping is recommended for three as for two straps, and the same reduction in thickness of box material is permitted; but when one strap is used it should have 60 per cent of this total strength, and less reduction in thickness of box material is permitted.

The ends of nailless strapping should be joined in such a manner that the joint will have not less than 75 per cent of the strength of the strap. When two or three straps are used, one should be placed approximately one-sixth of the length of the box from each end.

Nailed strapping.—Either annealed or unannealed straps may be used. The box should be nailed in accordance with the nailing schedule recently issued by the Department of Commerce. One strap should then be placed around the box at each end and nailed to the end with the same sized nails, but spaced twice as far apart.

Tightening of strapping; protection against rust.—All strapping must be drawn so tight as to sink into the edges of the box.

Strapping for boxes for export shipment should be galvanized or otherwise treated to protect it against rust.

Charts showing the size of straps to use and the size, number and positions of nails necessary will be supplied by the Department of Commerce on request through any district or co-operative office of the Department, or on application direct to the Transportation Division of the Department in Washington.

# Different Forms of Patent Agreements

By J. P. Nikonow

THE BEST time to sell an invention is, of course, after the patent has been issued. Only then has the inventor his rights and his title to the invention legally confirmed and, strictly speaking, only then has he anything to sell.

In practice, however, the inventor quite often disposes of his rights before the issue of the patent, usually at the time when the application for the patent is made. Such is the usual procedure, for instance, when an employee applies for a patent on some of his work for which he has been paid by his employer. A regular assignment form of an agreement is used, the employee surrendering all his rights on a patent in case the latter will be granted. Sometimes a clause is also inserted specifying that the inventor surrenders his possible rights in this invention in foreign countries. The inventor-employee does not lose any of his rights by such assignment for the simple reason that he has no rights, and the assignment serves only as a confirmation of the legal status.

Another form of assignment is frequently used, when an inventor assigns a part interest in his invention for financial assistance in prosecuting a patent. It may be a half interest or only one-tenth, depending upon the circumstances, value of the invention and the amount of assistance. This assignment is also executed, as a rule, at the time of filing patent application.

This form of assignment is not very satisfactory as it gives large and rather indefinite rights to either party, so that it should be supplemented with a working agreement as to the division of profits and respective rights.

### Various Agreements

It happens sometimes that a manufacturing company learns of an invention at the time when the application is made, but does not want to bind itself with a definite agreement as to royalties, guarantees, payments, etc., not being sure that the patent will be granted. An optional agreement is used in such cases, the essential points of which are as follows:

1. The company pays the inventor a certain sum for the right to have an exclusive option on the invention.
2. The option automatically terminates two or three months after the patent has been issued.
3. The option may leave the company free to choose any method of acquiring patent rights, either by an outright purchase, or by a license, exclusive or non-exclusive. But the option must specify the sums to be paid in each case.
4. The option must also specify the conditions on which the agreements may be canceled and original rights restored.

Usually it is much better for the inventor to wait until the patent is allowed and then only to begin negotiations. In this case better terms might be secured. The option is advisable, however, when the inventor is unable to develop properly his invention without assistance from the manufacturing company; and in such case the optional agreement may be used, the inventor usually entering the company's service at a regular salary.

In case the company, according to the option, retains the right to select the method of the purchase, then the inventor should consider his obligations if the company decides on a license, exclusive or non-exclusive. Usually he will find himself under obligation to legally prosecute all infringers of his invention, and this may be a very serious matter if the patent is not very strong. The cost of such litigations is very high, and the inventor would be better off if he made the company bear all the expense of such litigations.

Which of these forms of patent agreements is the most profitable to the inventor? As a general rule it must be said that every invention has a certain element of uncertainty and risk connected with its exploitation. Now if the inventor wants the manufacturer to bear all of this risk for instance by selling the invention outright, then he must also sacrifice a more or less large part of its value. If, on the contrary, he wishes to take part in this risk, for instance by making a royalty agreement and not requiring any advance cash payment, then he may get a much larger ultimate income. In selling or exploiting inventions the same universal law finds its application—that the profits depend directly upon the amount of risk incurred in the first place.

# Filling Worn Tire Flanges—Discussion

By C. G. Williams

The article by Clifford H. French on page 746, Vol. 60, of the *American Machinist*, under the title given above, interests me. There is no reason for worry regarding the process of filling in worn or sharp flanges on locomotive-driver tires, the flanges on pressed-steel car wheels, or on those car wheels where steel tires are used.

That there will be a few broken tires is to be expected. Tires broke long before oxy-acetylene or arc-welding were known. Why then should we blame the welding process for the break, when in the past no clear reason could be given as to why tires broke, and at the present time no definite studies seem to be made to determine why welded tires break occasionally?

On many roads there are some few grades where, from the action of the brakes that must be applied continuously, it is not an uncommon thing to see a flange heated to a degree that will start the color. If this heating is not injurious to a tire, why should the process of welding hurt it?

I have seen new tires, less than three months old, snap open similar to the one described by Mr. French, and no flaw or check could be detected. Why do any tires occasionally break without signs of flaws? The simple fact that the tire referred to opened up two inches, has no bearing on the good or bad effects of welding, but shows that the tire was given such a degree of shrinkage on the wheel center as to cause the opening. If the heating of the flange stretched that side of the tire and loosened the fit on the center, why did this welded tire open up two inches when it subsequently broke?

I have seen not only the flanges filled in but, in the case of a certain narrow gage locomotive, the entire tread of the tires filled in so that they gave double life. Otherwise they must have been removed and new tires shrunk on, as the wear was down to the safety limit. This was a case where power was badly needed, and the decision to prolong the working life of the engine by welding was highly commendable.

# Manufacturing Silent Chain Parts

By C. J. Priebe

## *Where Silent Chain Is Used*

Sixth article—Applications for power transmission—Wide adaptability—Heavy, high-speed and large reduction installations—Use on machine tools

SO MUCH has already been said in this series about the methods of manufacture of silent chain at the Morse Chain Co. in Ithaca, N. Y., that the use of the article itself should be considered in order to make the story complete. It is not our intention to show every use to which the chain can be applied, but to give some representative applications.

In the first place the field of application is so large that it would be difficult to enumerate the various industries and activities in which silent chain is used, as it has been adapted to almost every industry requiring power. Beginning at the source of raw materials it is found in the machinery used for mining and such work. It is used in rolling mills, rubber and textile mills and for both light and heavy drives in different types of manufacturing concerns. Also, there are literally millions of installations in automotive engines.

This last type of installation is shown in Fig. 40, which is an example of the "auto chain," the smallest of the Morse chains. Silent chain is employed chiefly because of its quietness and positive action. The proper "timing" of the engine depends to a great extent upon the accuracy of the chain.

### Chains for Large Power Drives

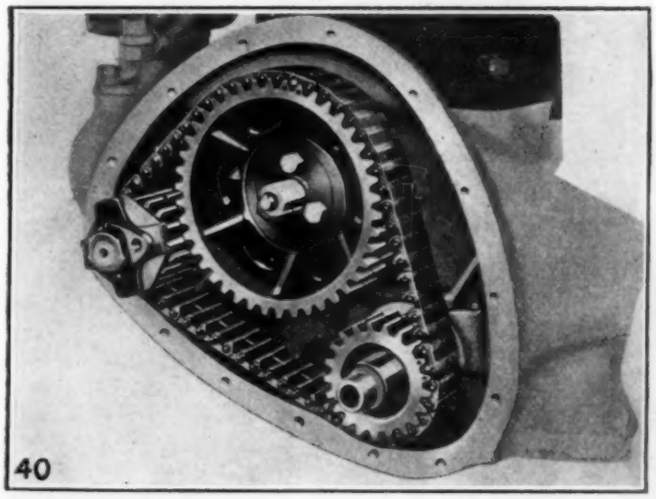
In large power drives such as used in rolling mills and power stations the chains often transmit over 1,000 hp. The advantage lies in the positive drive and in the short center distance that can be employed between the two shafts. Just as an example of size, Fig. 41 shows what is stated to be the largest chain drive ever constructed, where 5,000 hp. are transmitted.

Considering further the close-center drives, a typical application of such a chain driving an overhead lineshaft is shown in Fig. 42. It will be noted that a really small center distance is employed, although the chain transmits 100 hp. The advantage of this arrangement is that the motor is out of the way, and yet quite readily accessible. Short center distances can be employed, even with the chain vertical. An arrangement of this sort is useful for driving a floor-level lineshaft with the motor set on a low foundation. A similar belt drive would, of course, require an idler, not be positive nor provide as large a speed reduction.

### Chain Drive Arrangement for Lineshaft

A compact arrangement for lineshaft drive can be seen in Fig. 43. The unit is equipped with three chains and thus has three speeds available. It may drive a lineshaft for either of the machines below it, or for the machines on the floor above. The latter arrangement with the shaft below the floor can be recommended for many plants, as there are no overhead belts to reduce the light, and the floor space is greatly conserved.

Where individual motor drive is employed instead of lineshaft drive the silent chain is still useful. How such motors are connected up on a battery of reels in a textile mill is shown in Fig. 44. It can be seen that the chains are kept covered with sheet-metal covers, in order to prevent clogging with lint.



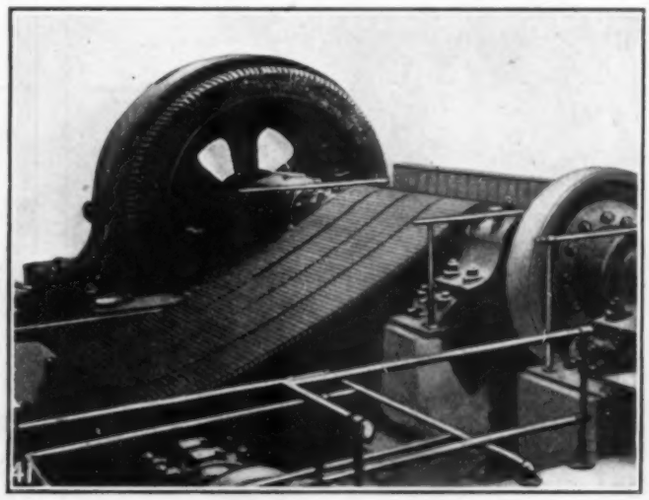




*Fig. 40—Front end chain drive on automotive engine. Fig. 41—Example of very large chain drive*

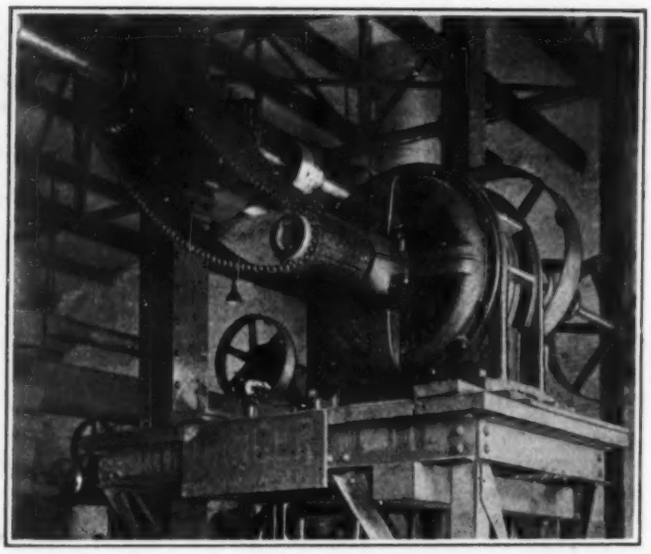
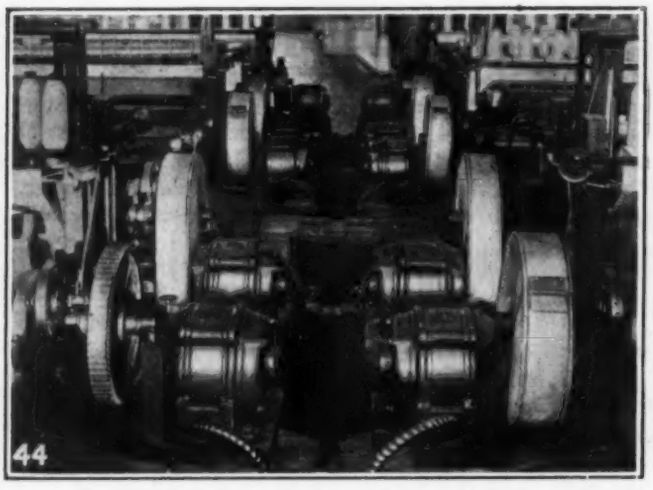


*Fig. 42—Overhead lineshaft drive by silent chain*

Where a very high reduction in speed is desirable, it is not always practicable to obtain it by means of a single chain, as the wheel becomes too large or the pinion too small. The usual ratio between the sprocket wheels in 1 to 5, although ratios of 1 to 8 or 10 are sometimes used. Frequently double reductions are employed as in Fig. 45, which shows a 2-hp. motor mounted on a tobacco-box packing machine. The motor speed is 1,140 r.p.m., while the machine shaft runs at 52 r.p.m., which is a reduction of about 22 to 1. It might be noted that the chain from the motor is narrower than the chain to the machine. The first reduction in speed has, of course, increased the torque; consequently, the tension in the second chain is greater and the width should be greater, provided that the pitch is kept the same.

The working speed of chain is usually considered as 1,200 to 1,500 ft. per min. However, chain is frequently run at very high speeds, taking for example that driving wood working machinery or connected directly to high-speed motors. The speed in such cases may go up



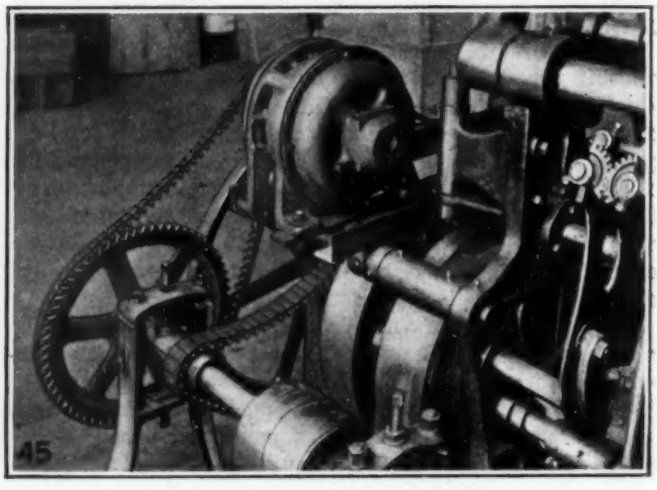
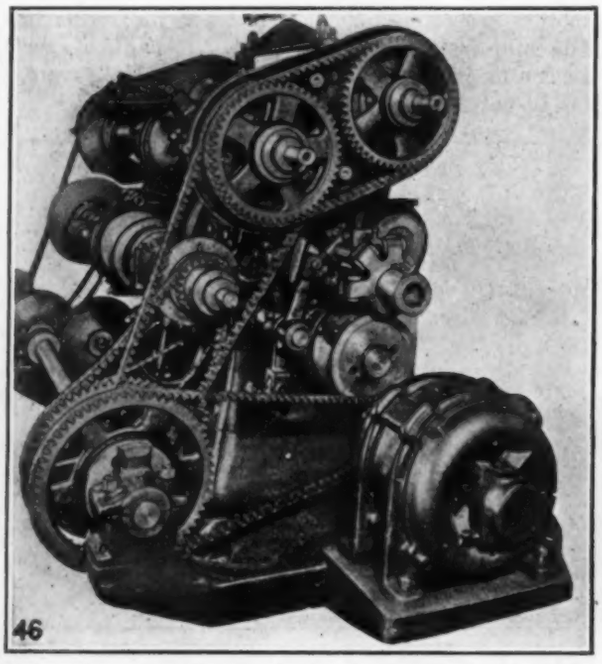




*Fig. 44—Individual motor drive through chain.* *Fig. 45—Double-reduction chain drive*



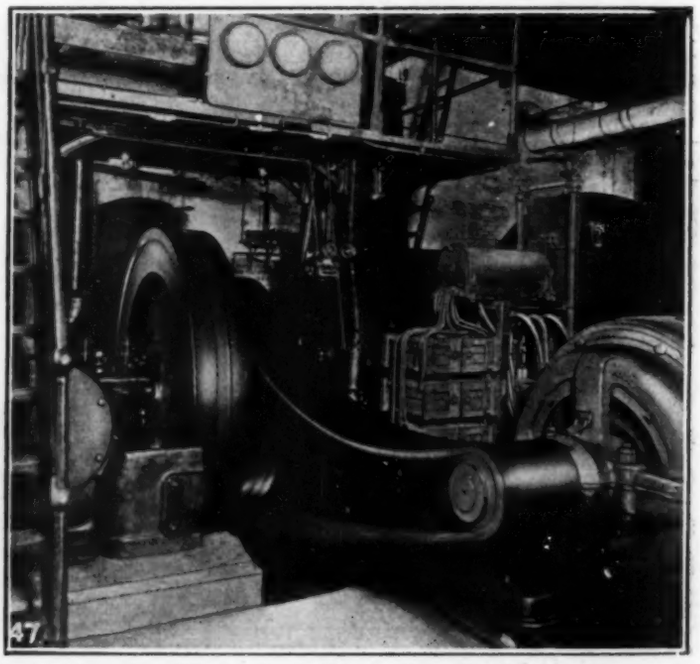




*Fig. 46—Seven chain drives on an automatic hub machine.* *Fig. 47—Motor and chain drive added to a compressor*

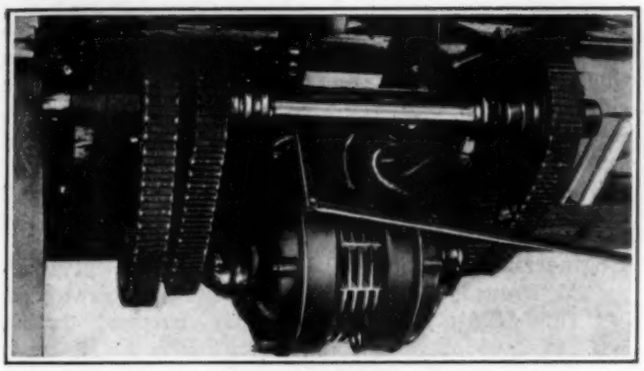


*Fig. 43—"Three in One" lineshaft drive*

to 2,000 or 3,000 ft. per min. At the other extreme silent chain is often used at very low speeds, chiefly because it gives the proper timing or relative rotation between the shafts. Many automatic machines serve as examples. The automatic hub making machine illustrated in Fig. 46 is particularly interesting because of its seven chain drives.

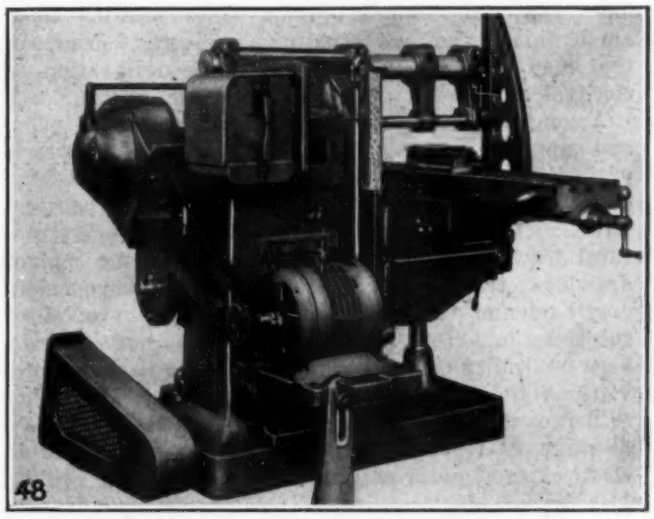


*Fig. 48—Milling machine with silent chain drive.*

On punch presses, compressors or such machines where the load is applied suddenly during a part of the cycle, a great strain is thrown on the driving chain. A belt under such circumstances can relieve itself somewhat by slipping; but a chain cannot, and would transmit the shock directly to the motor. The remedy that has been applied very satisfactorily in such cases is to employ a sufficiently heavy flywheel to prevent any large fluctuation in the speed. Chain drive is then employed without injury to either itself or the motor. Fig. 47 shows such a drive on an air compressor from which the steam engine has been removed. The electric motor stands where the steam cylinders were located.

Silent chains are frequently called upon to function in atmospheres filled with dust, grit or lint. Ordinarily, under such circumstances they are inclosed in covers, but even without covers they seem to give satisfactory service. Relatively high temperatures and moisture do not affect the chain as they would belting, so that silent chain is frequently employed for such purposes. Examples are stoker drives or those in steamy and humid atmospheres. In some cases the chain actually runs in, or is continually splashed by, water or other liquid. A good example is in a sewage disposal plant where the chain is exposed to the sewage, but seems to run along continuously without being harmed by it.

In the drives for machine tools silent power transmission chain is frequently employed. It has already been noted as a means of drive from a lineshaft to a machine, as well as from a motor to the lineshaft. Where individual motor drive is employed, however, is probably the principal field for the chain on machine tools. Fig. 48 shows a milling machine equipped with a chain drive, the individual motor being mounted on a hinged platen on the side of the machine. Frequently the motors are mounted on the floor, or on top of the machine, the latter arrangement being customary particularly with lathes. Fig. 49 shows chain drive to the gear box from the motor, with another chain from the box to the spindle of a Gisholt turret lathe.

Many other examples of drives to machine tools could be shown, but there is such a similarity between

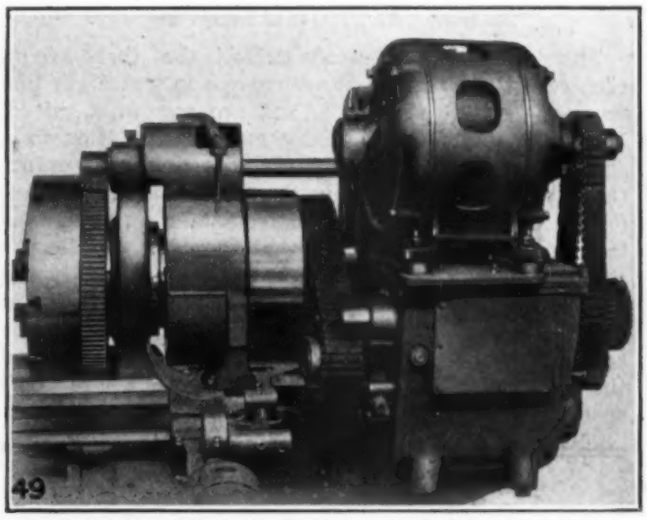


*Fig. 49—Chain drive on a Gisholt turret lathe*

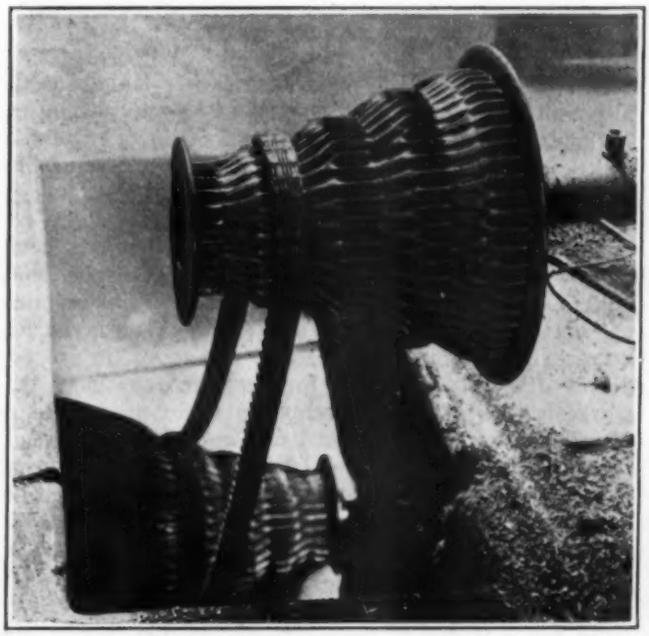


*Fig. 50—Cone drive with chain to give speed variation*

them that such treatment is hardly necessary. It should be noted, however, that very short drives can be employed, and that there need be no idler nor weight to obtain tension in the chain, as would be done with a belt. The system is applicable both to small lathes and such machines and to large planers and boring mills.

It is frequently considered that one advantage of belt drive to a machine is that cone pulleys can be employed to obtain a range of speeds. Such a thing has not generally been thought of for chain, but the scheme has however been so worked out as to be quite successful. In the Morse plant there are a number of machines so driven. Fig. 50 shows the drive to a boring mill from a lineshaft under the floor. A five-step cone is employed, so that the speed range is quite sufficient. The pitch of the chain is ¾ in. and the width 1¼ in. It will be noted that between each size of sprocket wheel on the cone there is a tapered portion and that there are grooves for the teeth in the tapered sections.

### How the Chain is Shifted

The real secret of the cone drive is that there are on each cone three teeth that are carried in a straight line from one end to the other, and are somewhat raised. When the chain is moved by means of a stick to a smaller wheel on the bottom cone, a pressure against the advancing side will move the chain to a larger wheel on the upper cone; the raised teeth take a grip on the teeth of the chain and carry it in place. While the chain is operating there is no danger of its slipping from the cone. Some of these drives have been in satisfactory use for many years. It is stated at the company that, in general, the cost is prohibitive, and that the drive would be employed only where some special need called for it.

## *Book Reviews*

**Payment by Results.** By J. E. Powell. Four hundred pages, 6x9 in. Cloth boards. Published by Longmans, Green & Co., 55 Fifth Ave., N. Y. City. Price $7.

Here is a book that emphasizes proper management, although dealing with the subject of how to pay labor. Following a reference to lack of good faith, as evidenced by the cutting of job rates, this statement is made in the preface:

"After having dealt with systems of payment by results for many years, however, the author has been forced to the conclusion that, in spite of superficial beliefs, the question, deep down, is one of economics rather than of good faith, and that the remedy is not necessarily, payment by results, which, by inference, places the responsibility for low output upon the workers, but is rather the acquirement, by management, of efficient production knowledge and the exercise of suitable production control. He believes that much of the trouble which has been experienced is due to the wrong use—the abuse—of payment by results, and has not been caused by its legitimate use."

Approximately the first half of the book is a discussion in the abstract of the question of payment by results and a review of a number of systems in common use.

Believing that, when costs are too high, the first consideration ought to be organization rather than the workman's energies, the author devotes twelve chapters to "Production Estimating." He deals, also with the subjects of job rates for apprentices, job rate records, job rate adjustment, the multiple-machine question and extra pay.

The book is a worthy addition to management literature.

**Engineering Drawing** (third edition). By Thomas E. French, Professor of Engineering Drawing at Ohio State University. Four hundred 6x9-in. pages, 656 illustrations. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York City. Price $3.

This book covers in a thorough and comprehensive manner the subject of engineering drawing as exemplified by the best practices of the engineering professions. It takes up the subject at the beginning by advising the neophyte in the selection of tools and materials, teaches him the art of using them in the most approved manner and instructs him in their application to the production of all classes of drawings that may legitimately come under the designation of mechanical.

Among the branches covered are: lettering; plane and applied geometry; orthographic and isometric projection; developments and intersections; machine details; dimensioning; technical free-hand and perspective sketching; the elements or architectural and structural drawing; map and topographical drawing; patent drawings; tracing and blueprinting. In the appendix may be found a rather complete bibliography of allied subjects; tables of standards for bolts, nuts, screws, keys and other minor machine details; a list of abbreviations and glossary of shop terms; and—if further evidence that the book is up-to-date is needed—a diagrammatic representation of the symbols used in electrical and radio engineering.

**Year Book of American Engineering Standards Committee, 1924.** 64 pages, 8x10¼ in. Published by the American Engineering Standards Committee, New York.

This year book gives a summary of the activities of the American Engineering Standards Committee and shows the numerous projects under way and the scope of each. It does not seem to be thoroughly understood in all sections that this committee is the national clearing house for industrial standardization, a federation of the principal national organizations and governmental departments that are active in such work. It serves as the official channel of co-operation in international standardization activities and as a bureau of information regarding standardization work both in this country and abroad.

The year book outlines the way in which the A.E.S.C. works with the various organizations, the Federal Specification Board, the Division of Simplified Practice inaugurated by Mr. Hoover and the national standardizing boards of Australia, Austria, Belgium, Canada, Czecho-Slovakia, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Sweden, Switzerland and the United States of America.

All who are interested in standardization will find much of value in this year book, which is a record of the work being done and the status of the various projects.

# How to Estimate Machine Shop Costs

By Albert A. Dowd

Further information regarding time estimates—Specific examples and calculations for various hand-milling operations—Points to be considered in estimating time for hand-profiling work

THE production on small work performed on a hand milling machine depends largely on the method of setting up the work, the speed of the cutters, and the industry of the operator. The speed is a fixed quantity and does not vary but, as the feed is controlled by a hand lever or a wheel, it is likely to vary considerably. It is better to consider the number of teeth in the cutter, and the speed at which it is to be run and then estimate the length of time necessary to make the cut, using a hand feed approximating one which would be suitable if fed by power. For example, let us consider a small straddle milling operation requiring hand feed, in which the diameter of the cutters is 4 in.; the speed of the cutters is 50 r.p.m., and the length of cut is 2 in. The feed here would normally be about 0.004 to 0.005 in. per tooth for cast iron, so with a 12-tooth cutter 0.060 in. travel per revolution of cutter would be about right. The operator might "crowd" the feed a trifle and use a little more than the amount specified but it would probably average about that mentioned. The conservative time-study man generally considers the feed as approximating power feed for the same kind of a cut even though it is done by hand. For very light cuts or finishing cuts on short surfaces, hand feed is often faster than power feed since the operator will force the work along very rapidly if there is only a small amount of stock to remove.

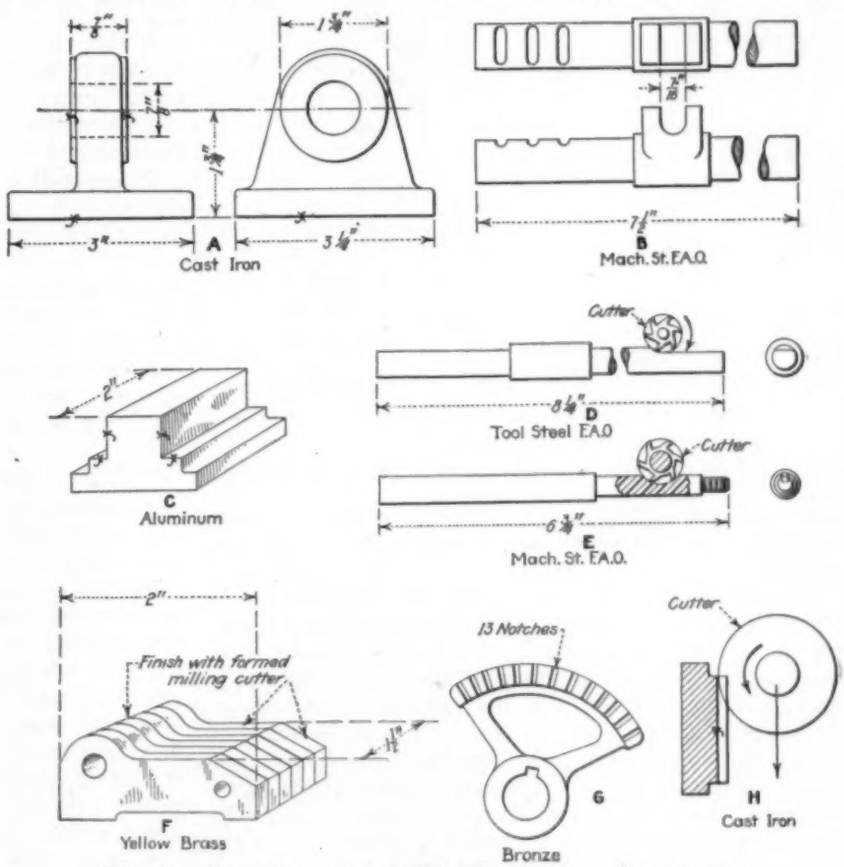



*Fig. 25—Several examples of hand milling machine work*

In Fig. 25 is shown a straddle-milling operation which is required in milling the bosses in example *A*. A face-milling operation is also needed for the bottom of the piece, as shown by the finish marks. The face-milling operation is done first, after which the straddle-milling operation is performed and the hole is then drilled through the boss. In making the time study of the first operation the work is considered as set up on a fixture two pieces at a time while an inserted-tooth face mill does the work. The total surface cut for the two pieces is $3\frac{1}{4} \times 2 = 6\frac{1}{2}$ in. Pieces are spaced $\frac{1}{4}$ in. apart and about $2\frac{1}{4}$ in. should be allowed for the approach and overlap of the cutter at each end. Therefore the total amount of feed required is $6\frac{1}{2} + \frac{1}{4} + 2\frac{1}{4} = 9\frac{1}{4}$ in. For face milling, feeds can be somewhat coarser than when an "over-and-over" cutter action is used, so that if the inserted-tooth cutter has a diameter of $3\frac{1}{2}$ in. and 14 teeth, we could allow 0.006 in. per tooth as a conservative feed. If we simply apply the method previously given to this example, we shall have $\frac{9.250}{55 \times 0.084} = 2.0$ min. for the cutting time. Allowing about 45 sec. for setting up and removing two pieces, which must be taken out of the fixtures and replaced by new pieces, we have a total time of 2.75

This is the ninth article. The eighth was concluded on page 57, Vol. 61, No. 2.

min. for two pieces, or 1.38 min. for each piece. A workman on piece work will probably do considerably better than this for he will force the feed in order to get all he can out of the cutters, and he may even make the entire cut in from 1¼ to 1½ min. It would be unsafe to use a figure like this in conservative estimating, yet the total time necessary might be cut a trifle and each piece rated at 1.25 minutes.

For straddle-milling the boss, the cutters are 5 in. in diameter, and have 20 teeth. The speed of the cutter may be 40 r.p.m. and the feed 0.006 in. per tooth. As the diameter of the boss is 1¾ in., we would have a length of cut 1.75 + 2.00 = 3.75 in., and the cutting time will be $\frac{3.75}{40 \times 0.120} = 0.78$ min. Two pieces are handled at a time, so we can allow 0.75 min. for setting up and removing the work, giving a total time for two pieces of 1.53 min., or 0.77 min. for each piece. The feed may be quite rapid on work of this kind, and the

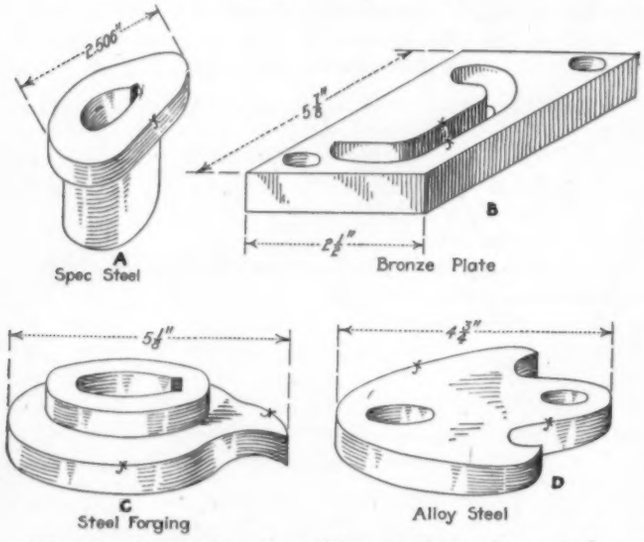



*Fig. 26—Examples of profiling work for time study*

handling of two pieces at the same time costs no more except for the equipment and increases the production greatly.

The next example *B* is a drop-forged gear-shift shaft which is finished all over, then hardened and ground on the cylindrical portions. We are at present concerned only with the milling of the ⅛-in. slot on a hand milling machine and the cutting of the three detent grooves at one end of the shaft. As the relation of the slot to the grooves is important, the cutters are so arranged that all four cuts can be made at the same setting. The work is held in special jaws in a quick-operating vise, this method assisting greatly in rapid removal and replacement of the work. The cutters used for the slot and grooves are 3 and 4 in. in diameter, respectively, but we can practically neglect the latter as the grooving cuts are shallow and the cutters finish at almost the same time. In figuring the time we can set the speed of the cutters at 65 r.p.m. and allow for a feed of approximately 0.004 in. per tooth. If the cutter has 12 teeth the feed per revolution would be 12 × 0.004 = 0.048 in. For a cutter having 24 teeth it would probably be advisable to cut down the feed per tooth to 0.003 in., but ordinarily the coarser spacing of teeth is best suited to roughing cuts, except on interrupted cuts when the finer spacing is advisable.

Assuming in the present case that our selection of cutter is a suitable one, the cutting time with a thickness of work of ⅜ in. and an allowance of ⅛ in. for approach will be $\frac{1.500}{65 \times 0.048} = 0.48$ min. The setting up and removal of the work would probably not consume over 15 or 20 seconds, but to be safe we can allow 0.50 min. The total time therefore will be 0.98 min. which is decidedly conservative and which would undoubtedly be cut down at least 25 per cent in actual practice.

In the example *C* we have an entirely different set of conditions, as the piece is an aluminum casting which is to be milled on the surfaces marked. This is a combination of straddle-milling and surfacing operations which does not require great accuracy, so that coarse feeds and high speeds can be used to advantage. The length of the cut is 2 in., the diameter of the cutter is 4 in., and the number of teeth is 16. The speed of the cutter can be set at 150 r.p.m., or even 200 if considered essential for the highest production. Taking the conservative speed, however, and adding one-quarter of the cutter diameter for the approach, we have $\frac{2+1}{150 \times 0.128} = 0.16$ min. for the cutting time, and, if we allow 0.30 min. for setting up and removing the work, the total time necessary for each piece will be 0.46 min. The method of holding is simple and the clamps can be rapidly operated, although only one piece is machined at a time.

Example *D* is given to show the application of time studies to a somewhat different kind of work. In the first place let us assume that the end of the milling cut terminates in a ⅛-in. radius at the point where the cutter is shown. It would hardly be possible to mill more than one piece at a time with a spiral end mill such as that shown. The length of the cut is 2 in. and the approach of the cutter about ¼ in. The cutter diameter is ¾ in. and it has six teeth. The cutter is revolving at the rate of 220 r.p.m., and the cutting time will be $\frac{2+0.25}{220 \times 0.018} = 0.57$ min. The setting up and removing time would be fairly rapid for this piece and can be taken as 0.50 min., making a total time of 1.07 min. for each piece.

So far we have not had occasion to feed a cutter directly into the work, but in the example shown at *E* this method of feeding is required. The part is a shaft in which a Woodruff key is to be set, and the work required is the milling of the circular seat for the key. On account of the cutting action the feed must be slower than normal, and the shape of the cutter and the small diameter of the shank do not permit a heavy feed. The cutter diameter is 1 in., it has 8 teeth, the depth of the cut is ⅛ in. and the speed of the cutter is 220 r.p.m. We shall assume a feed of 0.002 per tooth which gives us 0.016 per revolution of cutter. As the latter is fed directly into the work it is not necessary to allow anything for the approach, for as soon as it starts to cut it is only necessary to move it the required distance to finish the work. The cutting is, therefore, $\frac{0.3125}{220 \times 0.016} = 0.09$ minute.

It is usually advisable to set up work in which a keyway is to be cut on centers or else in V-blocks for which suitable clamps are provided, as it is of primary importance to cut the keyway absolutely central in the shaft. The setting-up time when only one shaft is milled at a time is quite rapid and 0.30 min. should be

sufficient when properly designed fixtures are used. Thus the cutting and setting-up time together only require 0.39 min., but to be on the safe side and in order to take care of chip troubles or broken cutters, it would be well to allow 0.50 min. for each piece. It might be mentioned here that any kind of a milling operation which requires the feeding of the cutter directly into the work must be estimated conservatively at feeds seldom more than 50 to 75 per cent of normal. There is a greater tendency to dull the teeth with this method of feeding even under the most favorable conditions.

The example shown at *F* is a form milling operation on brass strips which have been previously punched. This is a finishing operation which only removes a very small amount of stock. The work is set up on pins in vise jaws, six pieces at a time, the location being so made as to insure accuracy. A formed cutter is used to produce an accurate contour and, although cutters of this type usually have teeth set further apart than plain milling cutters, in this case we can assume 12 teeth since it is a finishing cut. The speed can be rapid because the material will permit it, so we will use 200 r.p.m. The feed per tooth should be rather fine to obtain a high finish, say 0.003 in. per tooth or 0.036 in. per revolution of cutter. The length of cut is 1½ in. without any allowance for the approach of the cutter, as the shape of the work is already very near to that desired. We can therefore figure the cutting time to be $\frac{1.500}{200 \times 0.036} = 0.20$ min. The setting up operation is rapid and we can safely allow 0.50 min., giving a total of 0.70 min. for six pieces and 0.12 min. for each piece. This is a very good example of the rapidity with which certain kinds of work can be done on a hand milling machine, especially when a number of pieces can be set up at the same time and when the amount of stock to be removed is small.

In the example *G* we have a bronze sector casting having thirteen radial notches cut in the sector portion. The notches are $\frac{1}{16}$ in. deep and of V-shape, but no great accuracy is required either in their location or in depth of cut. The work is set up on a hand-operated indexing fixture, so arranged that it is indexed and locked by a single pull of a lever which operates a ratchet and pawl. The indexing is done at the end of each return stroke of the table and the operator need use only one hand so that the other is free to move the feed lever as required. The width of the face to be cut is 0.500 in. and, since the groove is so shallow, no allowance need be made for approach. There are twelve teeth in the cutter and its diameter is 2½ in. If it is run at a speed of 112 r.p.m., this will give approximately the cutting speed needed for bronze and, as the cut is very short, it will be safe to use a feed approximating 0.005 in. for each tooth, or 0.060 in. per cutter revolution. The cutting time will then be $\frac{0.500}{112 \times 0.060} = 0.074$ min. This is the length of time necessary for one cut and, as there are 13 in all, the cutting time for all the slots will be $13 \times 0.074 = 0.962$ min. If we allow 0.50 min. for the indexing time and for the return of the cutters, this will be sufficient as both indexing and return of cutter are accomplished by single movements of the operator's right and left hands. In setting up and removing the work, it must be placed on a stud in the index fixture and clamped securely, and we should therefore allow about 0.50 min. for this operation. Adding together the cutting time, the indexing time and the setting up and removing time, we have $0.962 + 0.50 + 0.50 = 1.962$ min. If a simpler type of index fixture were to be used, the indexing time would doubtless be increased somewhat and the operator might be obliged to use both hands in the operation. Hence it is seen that rapid handling fixtures increase production very materially, particularly on work of this kind.

In the example *H*, a piece of work requiring a simple slotting operation for a steel block is shown. The slot in question is ⅜ in. wide by ½ in. deep and it is 2 in. long. The cutter used is 3 in. diameter and has 12 teeth and, as the material to be cut is machinery steel, 80 r.p.m. would give us about the cutting speed desired. In considering this operation the tool layout men desired to use a hand milling machine of the type in which the cutter arbor is mounted on a vertical slide to which a weight feed can be easily applied if needed.

### Gravity Feed for Hand Milling Machine

It is evident that with this type of feed a great deal depends upon the width of the cut, the kind of material machined and the amount of weight which can be applied to the feed handle. The advantages of the device are that one man can run several machines, even though the production time on each one may be somewhat longer than if the work is done by hand feed. In estimating the necessary time we can safely assume that a weight can be applied to the handle sufficient to produce a feed of 0.004 in. per tooth of cutter and, as there are 12 teeth in the cutter, the feed per revolution will be $12 \times 0.004 = 0.048$ in. The statement for this time study is as follows, allowing for ½ in. approach of the cutter: $\frac{2 + \frac{1}{2}}{80 \times 0.048} = 0.65$ min. In setting up and removing the work we should allow about 0.60 min. and the total for one piece is then 1.25 min. On machines using this kind of feed a little greater time allowance should be made, on account of the operator running two or three machines. The time study should contain a notation to the effect that "one operator only will be required for a given number of machines." The summary of the time study estimate would take care of the time allowance.

All of the examples and time studies given under the hand milling machine heading have been carefully worked out and as many different varieties shown as possible in order to cover the various phases of the situation. Every example is different in some way from the others in order to bring out a particular point.

Doubtless the best way of illustrating the important points which affect the time study man in hand-profiling operations, is by means of fundamental examples, a few of which are shown in Fig. 26. The example *A* is a simple cam having a hub, as shown, and a keyway from which the location is determined. This cam is to be roughed out only with a single cut around the contour. The final finishing is done after the cam has been hardened and the machine used for this purpose is a cam grinding machine.

In profiling this piece, the work must be set up first on the profiling fixture and securely fastened in place. The operator must then bring the follower pin into contact with the former plate and manipulate the two handles on the machine to control the feed and the position of the cutter with respect to the work. By

keeping the follower pin in continual contact with the former plate, the cutter is constrained to follow the desired outline. In order to determine the length of time necessary for making a profiling cut, we must first approximate the amount of travel necessary. In other words, we must determine the developed length of the outline, although it is not necessary to do this with great accuracy. Having an accurate drawing, a pair of dividers can be set to some convenient small dimension such as $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ in. and the contour can be carefully followed by stepping off the dividers all around the piece, counting the number of steps taken and multiplying this number by the size of each step. The length thus obtained will be near enough for estimating purposes although it will be slightly under the actual distance around the piece. In the example shown we find this to be approximately $6\frac{3}{4}$ inches.

If we consider the cam *A* to be profiled in the normal way using a single cut once around the piece and with a cutter of spiral form having six teeth, we can easily assume a cutting speed of 60 ft. per min. and our nearest approximation to this on the machine is 360 r.p.m. The material which is being cut is a special alloy steel containing a high percentage of nickel and chromium, so that a coarse feed cannot be used without injury to the cutter. We can, however, use about 0.002 in. per tooth and if the $\frac{3}{8}$-in. diameter cutter has six teeth, we shall have a feed of 0.012 in. per revolution of cutter. The cutting time will be $\frac{6.750}{360 \times 0.012} = 1.56$ min. In setting up this work, a stud with a key in it is used as a locater, the piece being held down by means of a nut on top of a C-washer, and the setting up and removing time will therefore be quite rapid. We need not allow more than 0.40 min. and this amount added to the machining time, gives 1.96 minutes.

### Cam Slot Profiling

In the next example *B* a very different kind of profiling job is illustrated. The work is a bronze plate in which two locating holes are drilled and reamed at diagonal corners. The piece is located by means of these two holes for the profiling operation, and the cam slot is thus milled in a definite relation to the holes. In milling a slot of this kind, the full width of the slot cannot always be cut at one stroke, as this would require a cutter always ground to the exact diameter. Even under these conditions, unless the cutter runs absolutely true, the slot would probably be over-size. Therefore a smaller cutter must be run around the entire outline of the slot in order to produce an accurate job. After measuring the total length which is to be cut and finding it approximately 11 in., we next decide upon the cutting speed and find that 440 r.p.m. will be about right for this kind of material. As the cutter must be smaller than the $\frac{3}{8}$-in. slot, a cutter diameter of $\frac{1}{4}$ in. would be suitable. Assuming that the cutter has six teeth and using a feed of 0.001 in. per tooth, we will have 0.006 in. feed per revolution of cutter giving the cutting time for the piece $\frac{11.000}{440 \times 0.006} = 4.16$ minutes.

In this example there are several points which consume a certain amount of time to consider. The work must be drilled at one end of the slot to allow the cutter to enter and the table must be moved over carefully to the correct spot before bringing the spindle down to the work, this movement taking five seconds or so. In cutting the cam slot itself, the operator must move rather carefully at the two ends of the slot in order to make sure that all the stock is removed. If he works too rapidly at these points, he will be likely to leave a portion at the end of the slots unfinished. This trouble will of course be found by the inspector when gaging the work, but for work of this kind, the operator should also have a gage which he can insert in the slot to make sure that he has completely finished it. It would be better, therefore, to allow 4.5 min. for the cut, including the entering of the cutter and its removal from the work. For taking off the piece and putting on another one, we should allow 0.5 min. The total time necessary for this work will therefore be $4.5 + 0.5 = 5.0$ minutes.

### Roughing and Finishing Profile Work

The next example *C* requires both roughing and finishing operations and it should therefore be done on a two-spindle profiler, using one cutter for roughing and another for finishing. This work is quite large and it must be accurately machined. We find the length of the surface which must be covered to be about $15\frac{1}{4}$ in. and the cutter used is $\frac{3}{8}$ in. in diameter with six teeth. We use a speed of 320 r.p.m. and a feed of 0.003 per tooth in the roughing operation, so that the cutting time will be $\frac{15.250}{320 \times 0.018} = 2.65$ min. The second cut around the work can be done much more rapidly because there is less stock to remove, and we would be perfectly safe in allowing one-half of the above time for finishing, say 1.33 min. The setting up of the work is very simple, as a stud is used similar to that used on the fixture for the cam *A*. The time allowance for the setting and removing of the work is 0.50 min. and the total time for one piece roughed and finished is therefore 4.48 minutes.

In the last example *D* a peculiar form is to be cut and there are two sharp corners which must be carefully profiled. Only one cut is required, however, but it must be done rather slowly as the cutter diameter can only be $\frac{3}{8}$ in. Cutters of this size cannot be forced very much as they are very apt to break if a little extra pressure is applied. The speed of this cutter is set at 586 r.p.m. and the distance to be traveled is found to be $10\frac{1}{8}$ in. The feed per tooth should not be over 0.002 in. and, as there are only five teeth in the cutter, the feed per revolution would approximate 0.010 in. The cutting time will then be $\frac{10.125}{586 \times 0.010} = 1.73$ min. The work is set on a fixture containing two pins which enter the reamed holes in the piece, and a nut and a C-washer is used on each stud to hold the work firmly. The operator must, of course, use a wrench on both nuts, but if the threads are made loose he needs only to start the nut with a wrench and then remove the C-washers with his fingers. If we allow 0.4 min. for setting and removing the work, it should be sufficient and our total time for one piece would therefore be $1.73 + 0.4 = 2.13$ minutes.

The examples of profiling given are sufficient to illustrate the application of time studies to this kind of work, although there are many odd problems which occur from time to time. It is only necessary for the time-study man to apply the principles which have been mentioned here, keeping in mind continually the care necessary when working around sharp corners or with very delicate cutters.

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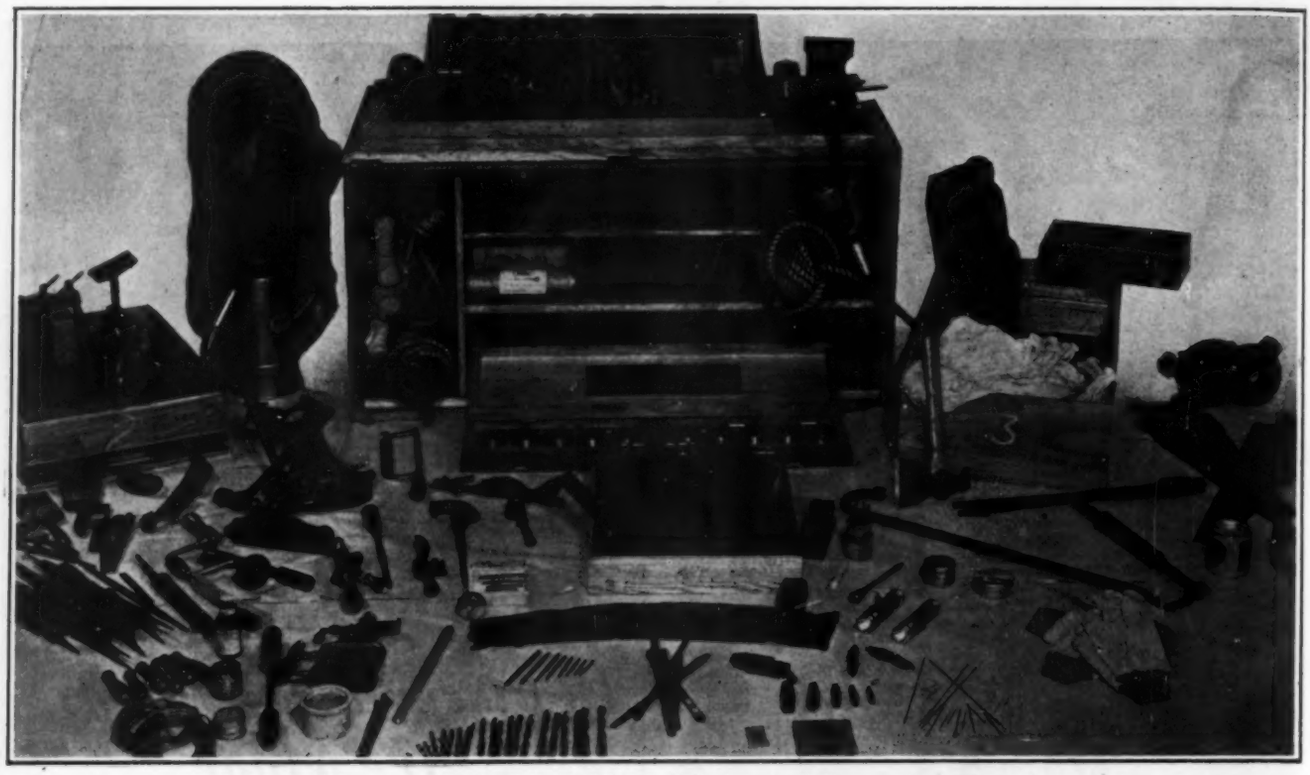
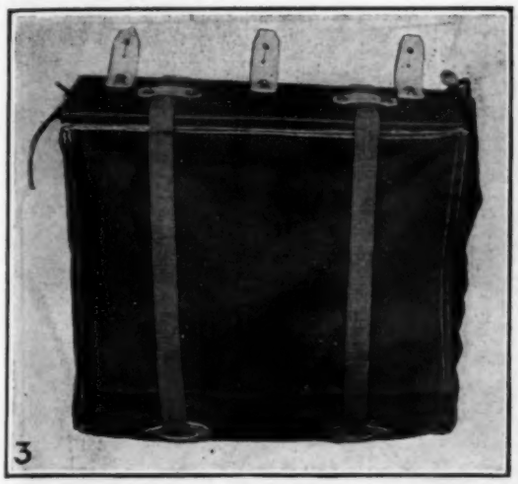


*Fig. 1—A typical tool shipment for one of the main bases*

*Fig. 2—Miscellaneous spare parts for shipment to a main base*



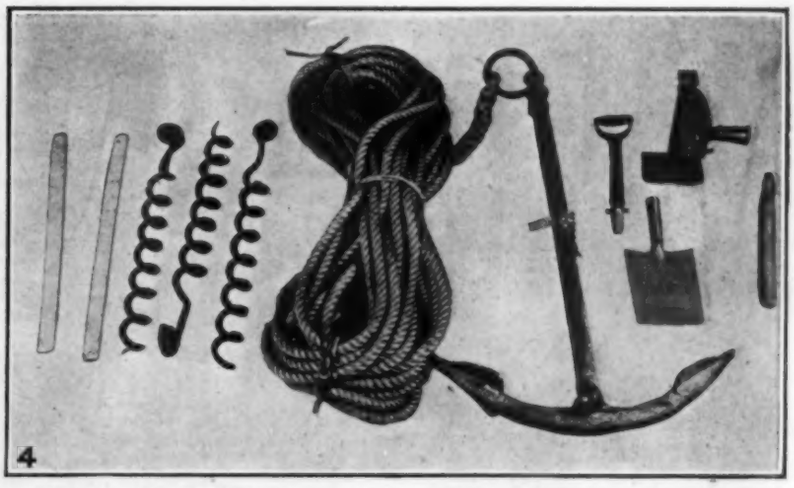


*Fig. 3—Tool kit packed for flight. Fig. 4—Tire irons, land anchor, etc.*

# *Tools, Supplies and Equipment for the Round-the-World Fliers*

Piloting the round-the-world planes across the northern Pacific Ocean to Japan and Asia was a feat of which we may all be proud, and hearty congratulations are due the personnel of the three planes that accomplished the hazardous voyage. But we must not forget the painstaking preparations without which the achievement would have been impossible, regardless of the skill and daring of the pilots and their assistants. To Capt. E. E. Adler, supply member of the Round-the-World Flight Committee, belongs great credit for much of the work done in selecting the 581 items of equipment finally selected.

Supplies were sent to six main bases; Seattle, Wash; Yokahama, Japan; Calcutta, India; San Stefano, Turkey; Brough (near London) England; and Ivigtut, Greenland. There were also minor bases, many of them at places not at all familiar to us, some being mere trading posts. But gasoline, oil and similar supplies had to be obtained at frequent intervals and in many parts of the journey filling stations were few and far between.

Photographs by U. S. Army Air Service

To the six main bases were sent many of the larger parts, such as complete landing-gear assemblies, pontoons, wing sections, gasoline tanks, etc., not forgetting the 35 complete Liberty motors which were distributed at suitable points. All airplane assemblies were built by the Douglas Aircraft Co., of Santa Monica, Calif., builder of the planes, but other parts and spares were shipped from Air Service stock at Fairfield, Ohio.

The work of planning included visiting every landing place, noting its characteristics, pointing out obstructions in the vicinity, etc., and when we realize that a fully loaded plane on pontoons should have a 2½-mile straightaway for taking off, some of the difficulties are realized. The tools, spare parts and supplies such as screws, bolts, files, soldering outfit, wire, buckets, glue, varnish, etc., all required careful consideration, for minor repairs have to be made on any machinery from time to time and particularly when subjected to such stresses as are encountered in a flight of this kind. Fig. 7 gives a general idea of the supplies needed.

This phase of the undertaking emphasizes the value of carefully studying the conditions to be met in any enterprise, as well as the necessity for logical planning and preparation. Furthermore, it gives a better idea of the variety and extent of equipment and supplies needed in aviation, than most of us ever imagined would be necessary.

*Fig. 5—Contents of tool kit for No. 1 airplane. Fig. 6—How tools are packed*

*Fig. 7—Scene in packing and inspection room where tool kits, spare parts and other supplies for planes and bases were assembled*

# Fiat Automobile Production Methods

By J. A. Lucas and F. E. Bardrof

## Operations on the cylinder block of the four-cylinder motor —American machine tools used for milling, drilling, boring, reaming and grinding—Roller conveyors between machines

WHEN the cylinder blocks for the Fiat motors arrive at the Lingotto plant they have already undergone a preliminary machining at the foundry. The machine shop in which this work is done has been described in a previous article. The preliminary work consists of the rough-facing of the tops and bottoms of the blocks and the removal of fins, after which the castings are transported to the Lingotto plant by auto trucks or trains. The machine tools on which the first operations on the block are performed are located on the first floor of the building and the castings are unloaded from the trucks or cars through openings in the windows.

A receiving station for the block castings is illustrated in Fig. 35. The parts slide down the inclined

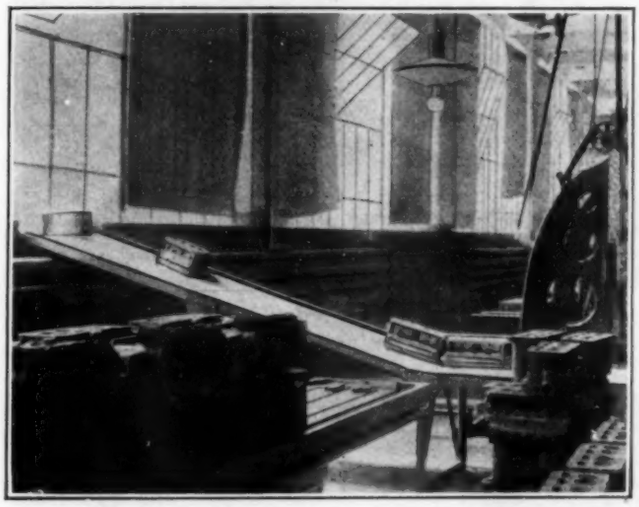


*Fig. 35—Entrance chute for cylinder block castings*

chute provided inside the window opening and are either placed on the roller conveyor leading to the Ingersoll milling machine or stored on suitable racks, if necessary. There are three Ingersoll machines of the planer type shown in Fig. 36, and for each machine a receiving station is conveniently located. Each machine has four cutters and the castings are clamped in two rows on the table as illustrated. One row is placed with the top uppermost, the other row with the valve guide chamber up. The right-hand vertical cutter is engaged in surfacing the tops of the castings, the others meanwhile finishing the surface of the flange against which the valve cover is clamped. The machine is loaded and unloaded while in motion. Similar machines finish the bottom of the block and the surface of the carburetor connection boss.

At the milling machines the blocks are placed on another conveyor upon which they pass to the boring and drilling machines shown in Fig. 37. The end of the conveyor will be noted at the lower right-hand corner of the picture, the casting being convenient to the first machine, on which two locating holes are drilled and reamed in a suitable jig. The five multiple-spindle boring, reaming and drilling machines constituting the remainder of this production line are products of the Foote-Burt Co., Cleveland, Ohio. These are standard single-purpose machines and the operations performed in the line include boring and reaming of the cylinder bores, drilling and reaming the valve guides, finish-reaming the cylinder bores and finishing the valve seats.

In Fig. 38 are shown two more Foote-Burt machines, the one at the left drilling the holes for the cylinder-head bolts. The machine at the right is engaged in drilling crankcase bolt holes and in finishing the holes for the push rod guides at the same time. The four single-spindle drills in Fig. 39 were manufactured in the Fiat plants. On the left-hand machine, a multiple drilling attachment is being used to drill the holes for the carburetor bolts, a central cutter simultaneously machining the hole by which the gas enters the passage leading to the inlet valves; the next machine is finishing the hole for the fan shaft clamping bolt and the cooling water hole; the third machine is finishing the

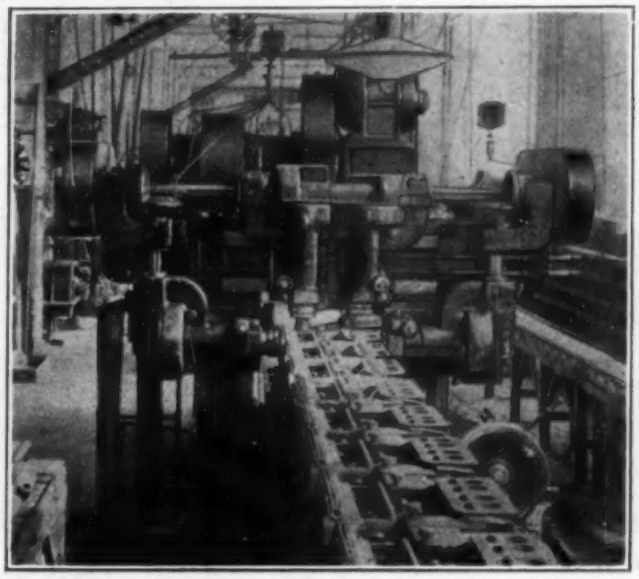


*Fig. 36—Ingersoll milling machine surfacing castings*

This is the eighth article of the Fiat series. The seventh article was concluded on page 53, Vol. 61, No. 2.

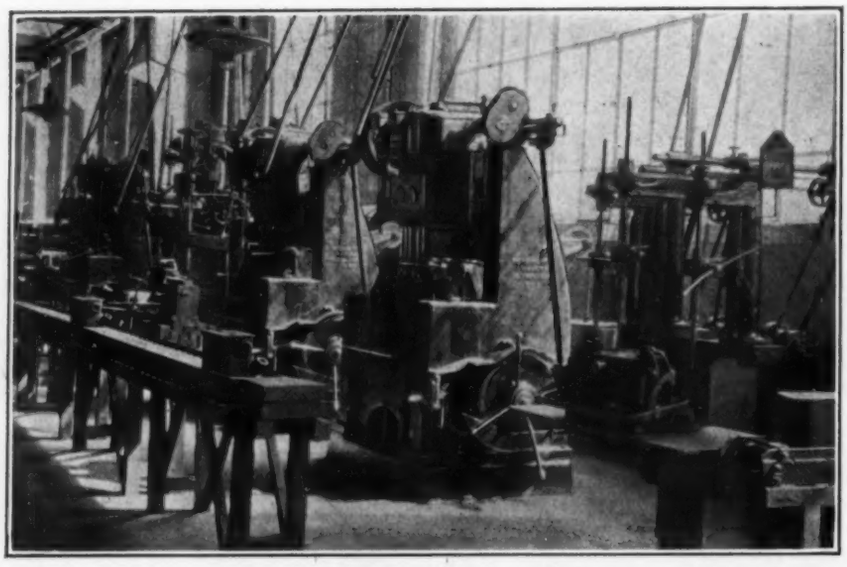


*Fig. 37—Foote-Burt boring, drilling and reaming machines*

hole for the fan shaft; and the fourth bores and spot-faces the hole through which the air supply to the carburetor enters. This air passes through the valve guide chamber and to the carburetor through a cored passage in the block casting.

The special milling machine and fixture shown in Fig. 40 is used for milling clearance grooves for the connecting rods in the lower edge of the cylinder bores. The milling head of the machine has four horizontal arms which project into the bores as the work is fed to the cutters. At the outer end of each arm a vertical end mill is located, and these end mills cut the grooves as the block feeds past them. These grooves can be seen finished in the block illustrated in Fig. 41, and a better view of the milling mechanism will be given in connection with a later article. Fig. 41 also shows the set-up for finishing the exhaust pipe connection. The connection is bored, faced and threaded on this machine.

The Foote-Burt machine illustrated in Fig. 42 performs the operation of drilling all the water holes in the top of the block. The milling operation in Fig. 43 finishes the sides of the slots into which the push rod guides fit, and the lower ends of the valve guides are being spot-faced on the drilling machine in the distance. The spot-facing tool is introduced through the slots just milled.

The fan shaft is clamped in its bracket and the operation of slitting the fan bracket to form the clamp is shown in Fig. 44. The slitting saw is mounted on the arbor of a vertical milling machine and two facing cutters are mounted on the same arbor for the purpose of facing the ends of the clamping bolt bosses.

The block is now ready for the grinding of the cylinder bores as pictured in Fig. 45. The block is clamped on a suitable angle-plate fixture and the bores are ground in turn on an internal grinding machine. For removing the grit and dust from the bore while the operation is being performed the funnel-shaped end of an armored hose is brought close to the other end of the bore. This hose is connected to the exhaust system of the building.

A survey of the cylinder grinding department shows many American tools. Outside of four or five machines of other makes, these machines are all products of the Brown & Sharpe Manufacturing Co., Providence, R. I. We mentioned in the description of the Fiat ball-bearing plant that all the grinding departments used Norton wheels and this practice is also followed exclusively in the grinding department at the Lingotto plant.

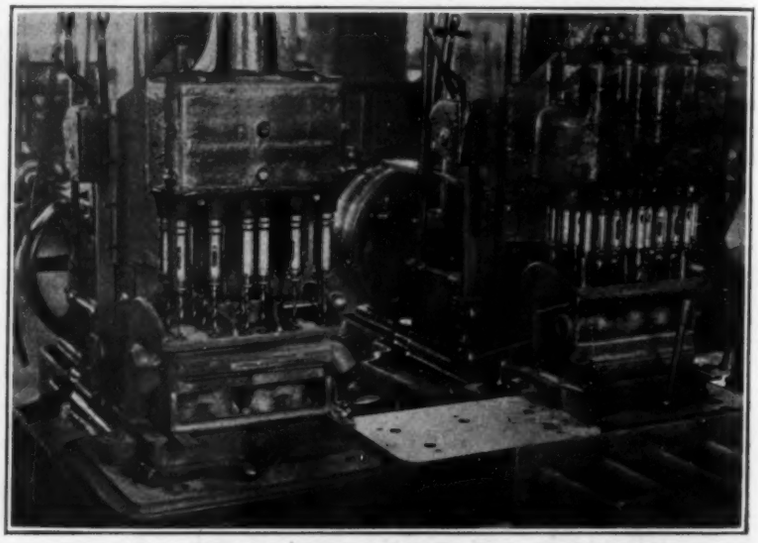
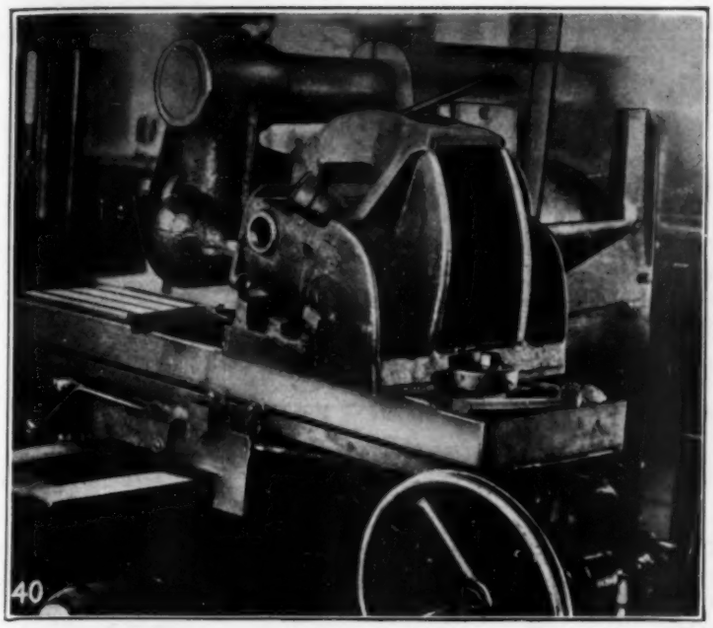
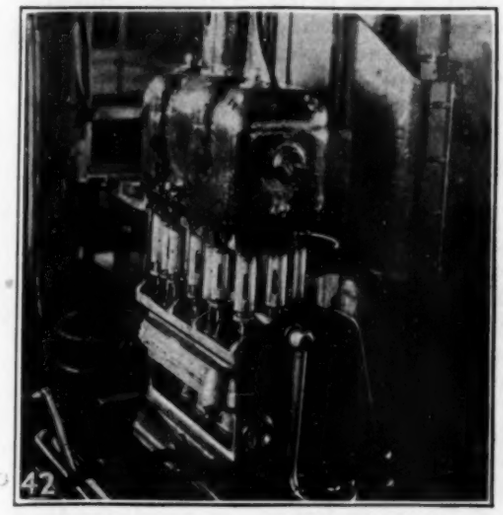
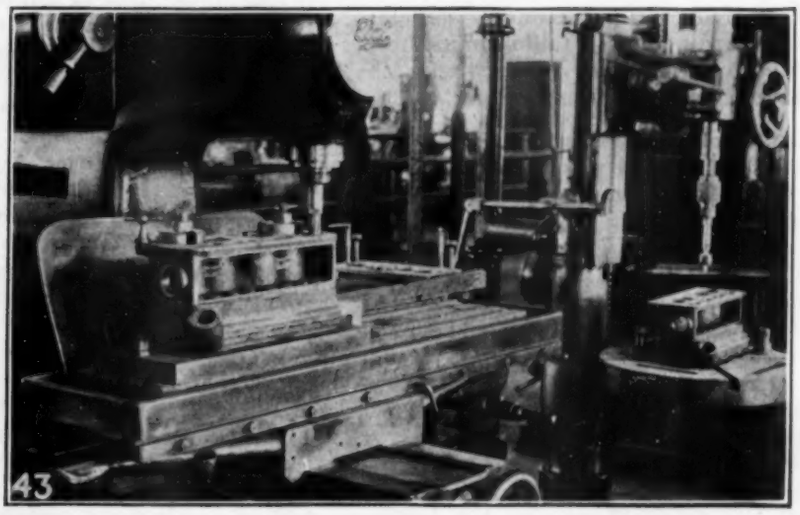


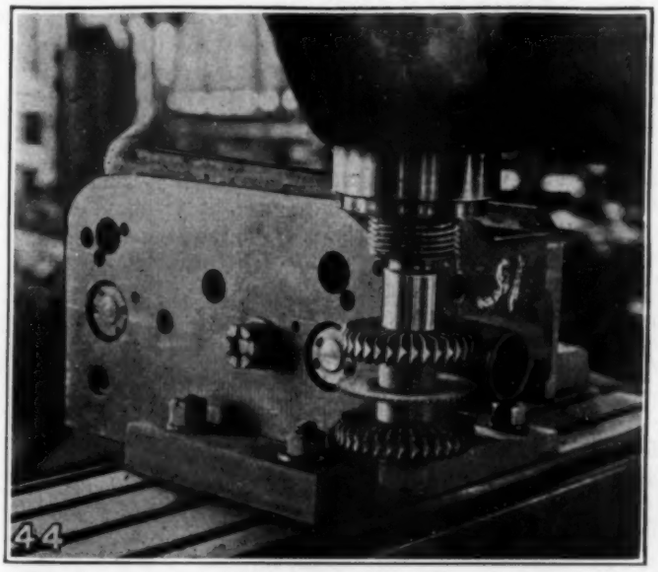
*Fig. 38—Foote-Burt machine drilling bolt holes in top and bottom of block*

*Fig. 39—Drilling operations on car buretor boss, fan bracket and valve guide chamber*





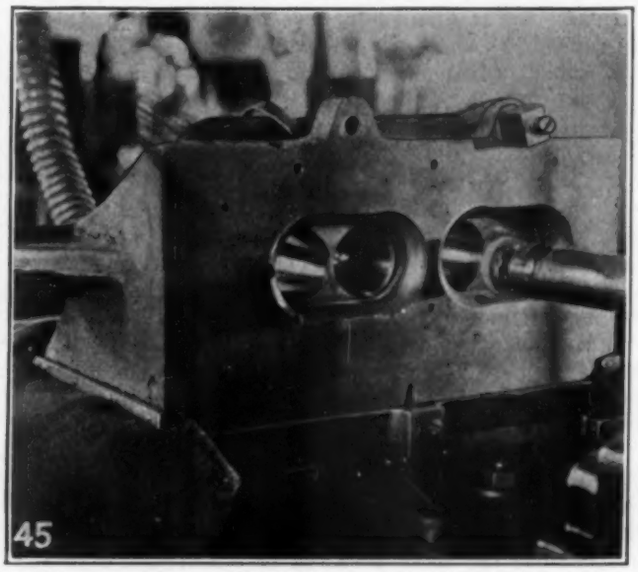




*Fig. 40—Special set-up for milling connecting rod clearance grooves. Fig. 41—Exhaust connection machining work. Fig. 42—Drilling water holes in the top on a Foote-Burt machine. Fig. 43—Milling push rod guide slots and spot-facing valve guides. Fig. 44—Fan bracket milling operation. Fig. 45—Cylinder bore grinding on a Brown & Sharpe machine*

After the grinding is completed, the finished block is tested under hydraulic pressure for leaks and then, if satisfactory, is sent to the assembly department to take its place with the other elements of the motor.

## Queer Estimates of Metric Savings

By I. B. Rich

The old quip to the effect that "figures won't lie but liars will figure" seems to be borne out in a recent editorial in the Chicago Sunday *Tribune* in which some unknown "expert" is quoted as estimating a saving to the United States of $315,000,000 a year by the adoption of the metric system. The tabulation which I quote reminds me very forcibly of Mark Twain's wonderful satire in which the visionary Colonel Sellers estimates his profits to be secured by selling eyewash to the inhabitants of China. The tabulation follows:

| | |
|---|---|
| Time lost reducing between systems..... | $5,000,000 |
| Profit lost on foreign trade..... | 20,000,000 |
| School taxes for term of eight months..... | 50,000,000 |
| Support of children through school term.... | 100,000,000 |
| Lost productive power during school..... | 75,000,000 |
| Lost earning power, failing in arithmetic... | 25,000,000 |
| Time lost in commercial calculation..... | 30,000,000 |
| Extra expense for instruments..... | 10,000,000 |

Still another expert, also unknown, puts the annual loss at $750,000,000 a year. And we didn't even dream it!

A little study of the items will show the sort of alleged reasoning employed. Consuls and others who have studied the question of export, are not at all sure that the lack of metric measurements loses us any appreciable foreign trade. More attention to proper merchandising and crating would probably save us far more than the proposed change to metric units.

The next four items, a mere $250,000,000 loss, are about as fantastic an estimate as I have seen. Just how $50,000,000 could be saved on school taxes each year, even admitting the simplicity of the metric system, requires some sort of psychic calculations with which I am not familiar. As addition probably causes as many failures as any phase of arithmetic, it is a bit difficult to see how the metric system will prevent $25,000,000 worth of such failures.

The best thing about the editorial is the admission that new drawings, new patterns, new metric tools, changing or rebuilding jigs and fixtures and retraining labor would be necessary to make the change. In the past this has been disregarded or denied by many advocates. Dr. J. V. Collins is quoted as saying that the total expense of making the change would be about $600,000,000, so we may perhaps assume that he is the expert quoted previously. Judging by the quality of gray matter displayed in the first tabulation I should hardly want to bet very heavily on the accuracy of the estimate as to the cost of abandoning our present system.

As in most cases, the writer of the editorial confuses metric and decimal systems and is evidently not aware that almost the entire machine building industry uses the decimal systems with the inch as the base. And not because the inch is sacred or was founded in the pyramids, or is one five hundred millionth part of anything else, but because it is a convenient unit for machine use, and because the great majority of machines and machine equipment in the world has been built with the inch as the basic unit. Practically all engineers advocate the decimal system. And if they could be shown sufficient reason for changing the basic unit from the inch to the meter there would be little opposition to the change. But it will take better logic than is contained in the preceding table of estimated savings to make them become metric enthusiasts.

The decimal system is firmly established in all machine building establishments. But most of them believe the inch is a better unit than the meter.

# Motor Shop Problems

## *Light Weight Pistons*

By Frank C. Hudson

THE desire to make light pistons for automobile motors is not new, even though some makers still cling to cast iron as a piston metal. Ten or twelve years ago our British brethren were experimenting with pistons of forged steel in order to reduce weight. Slipper-type pistons were also in use, while some of the cast-iron pistons for small-bore motors, were amazingly thin and consequently very light.

The desirability of cast iron as a bearing metal is still leading many to experiment with light-weight castings. A few make combinations of a cast-iron skirt and aluminum head. Fiat has an aluminum-alloy piston with two bearing rings of cast iron, cast into the aluminum skirt.

The tendency, however, is toward the light-metal pistons of various alloys, usually with an aluminum base. Some of the late developments have steel plates cast into the aluminum alloy on each side, the piston-pin bosses being supported by the steel stamping. This type of piston can, it is claimed, be made without slitting the skirt and still have no more than the usual clearance given cast-iron pistons.

Some still insist that cast iron is the only metal for motor pistons and point to failures, or unsatisfactory results, when alloys have been used. And there is no denying that there has been a lot of grief with the alloy pistons. But many thousands are in service, and it is quite possible that failures have come from ignorance in regard to their use.

Among the newer alloys that are seeking favor is magnesium, which is considerably lighter than aluminum. The generally accepted weight is about two-thirds that of aluminum, which is more difference than most of us realize. It is being used for pistons to a limited extent.

A hint from the makers of magnesium in regard to its wearing qualities may be of value in the use of all of the light alloys. Their experiments indicate that much depends on the initial smoothness of the wearing surfaces. In cylinders, for example, they find that a highly polished surface is of more importance than absolute roundness.

It is just possible that the lack of this polish may be responsible for some of our failures, especially in the low priced cars where cylinder polish has not been considered of vital importance. For if the polish, or lack of it, affects the satisfactory wear of magnesium pistons, it is very possible that aluminum pistons may also be affected, even if to a lesser degree.

# Ideas from Practical Men

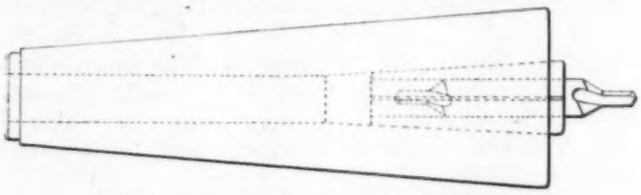
**Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for**

## Collet Chucks from Old Lathe-Centers

BY GAYLORD G. THOMPSON

Instead of throwing the old lathe-center into the scrap box when it has become so short as to be of no further service in its original capacity, use it as a basis of a collet chuck to hold small drills or drill-rod in the same lathe. The sketch shows how it is done.

With the center in its proper place in the spindle of the lathe, square off the end and then bore and



*Collet chuck made from old lathe-center*

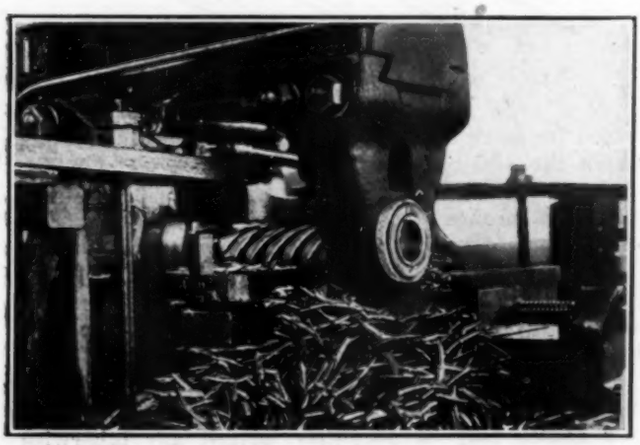
ream a taper hole lengthwise through it to fit a large-sized standard taper pin. Next, with the pin in the hole and the center still in the lathe, drill a hole through the pin to take the desired size of drill or rod. Now drive out the pin and with a hacksaw cut a radial slot the whole length of the pin from one side only.

That is all that is necessary, except to take the burrs off. and to harden and temper the pin if desired. To use it as a collet chuck put the work in the drilled pin, put the pin in the center and tap it in by means of a small hammer and a drift of brass or other soft metal. The split pin will close upon the drill and hold it quite tightly.

## Milling Radius-Bar Jaws

BY TOM J. O'REILLY

The operation of milling out the jaws of a radius bar, as done in the Parsons, Kas., shops of the M. K. & T. Railway, is shown in the illustration herewith. The radius bar is of forged steel and is milled from the solid, using a 2½-in. left-hand spiral cutter in a No. 4-Cincinnati milling machine. The cutter runs at a speed of 65 r.p.m. and, as the lowest power feed available on the machine is ¾ in. per min., which is too heavy, the cutter is fed by hand. A heavy flow of lard oil facilitates the cut. The cutter is fed into the solid piece along the bottom layout line and out at the top, using only the layout and a scale to gage by. The time required to mill the slot is 3 hr., and the piece is finished all over on the milling machine in 14 hr., which includes the set-up time. The operator states that the same operation on the shaper required approximately 3½ days.



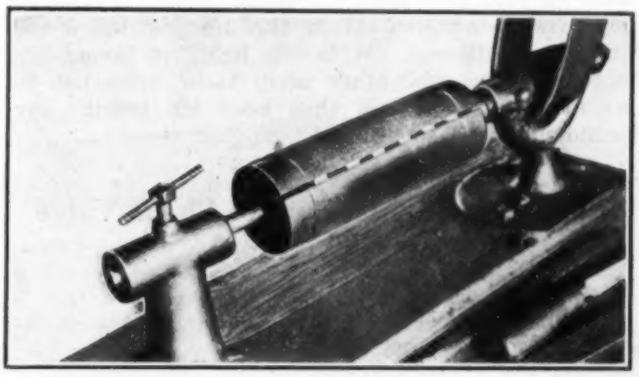
*Milling out jaws in radius bar*

## Attaching Abrasive Cloth to a Polishing Drum

BY JACK WILLIAMS

A handy little tool that is common to pattern shops and might well be equally serviceable in machine shops and toolrooms is the "sanding-drum," an example of which is shown in the accompanying illustration.

In the pattern shop the drum is usually made of somewhat larger diameter than here shown and the



*A handy polishing drum*

abrasive supplied by gluing to the surface of the wood a sufficient area of sandpaper to cover it. When the abrasive has all been rubbed off it is the job of somebody, usually an apprentice, to scrape off the remains, true the drum and glue on fresh sandpaper.

The drum here shown is of a circumference to require about one inch less than the length of a standard-sized sheet of abrasive cloth to cover it and no glue or other adhesive material is needed. A kerf is cut lengthwise of the drum by means of the ordinary circular saw of the pattern shop, a strip of the cloth wound around the drum and the ends tucked into the kerf, and a row of pine wedges driven into place as shown.

Driving the wedges tends to stretch the cloth tightly

around the drum, smoothing out all wrinkles and folds and holding it so firmly that it cannot come loose. When the abrasive is worn off it is but the work of a minute or two to pry out the wedges with a screwdriver, substitute a fresh piece of cloth and drive in the same wedges or new ones.

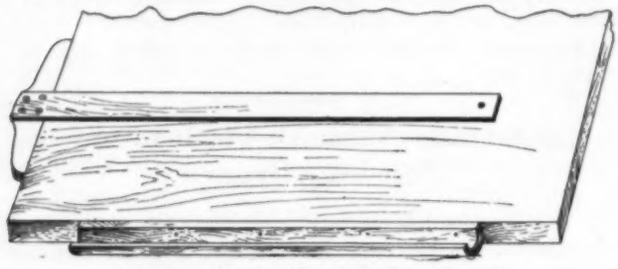
The drum is made of hardwood and provided with centers or with a shoulder of smaller diameter to be gripped in a drill chuck. It is always ready for service in any lathe that is provided with centers, or in any machine with a revolving spindle capable of holding a chuck.

## A Help for the Draftsman

By Edward Heller

A wooden trough attached to the front edge of the drawing board, as shown in the accompanying illustration, is useful in more than one way. Rolling pencils, or sliding instruments are caught in it and prevented from falling to the floor.

The trough is made of a strip of wood about 1 in. wide. If it extends two-thirds the length of the board



*A trough for the drawing board*

it will be sufficient, although the length of the entire board would be better.

The strip is fastened to the edge of the board by means of good glue and a few nails.

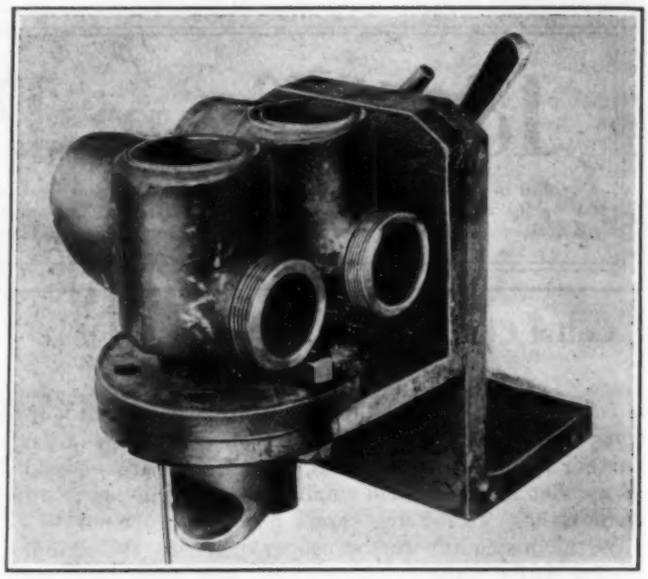
With such an addition to the drawing board the draftsman will soon get in the habit of laying his pencils, erasers and other small tools when not in use in the trough and thus keep his board clear for moving the T-square and triangles.

## Jig for Machining Double Check-Valve Casings

By J. H. Hahn

The manufacture of casings for the double check-valves used upon the boilers of heavy locomotives, presents not a few problems in the average railroad machine shop because of the several set-ups required to handle it in the ordinary way; besides which it is a rather troublesome job when mounted on the faceplate of an engine lathe. The accompanying illustration shows a jig, designed by F. H. Wicks, foreman of the toolroom in the Portsmouth, Ohio, shops of the Norfolk & Western Railway, for doing all the work on a drill press.

The castings are usually handled in lots of from 24 to 48 pieces. The first operation is to face the joint, after which the flange is jig-drilled for the bolts, and the casting is mounted on the device here shown. Special seating tools, made in the toolroom, are used, as well as reamers, taps, dies, etc., that may be purchased from stock if desired.



*Jig for machining valve casings*

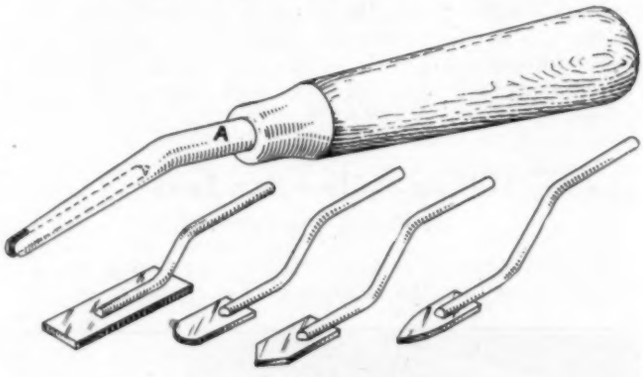
This fixture saves about 1½ hr. over the time previously required to machine each casing, and as all the work can be done in the drill press, it releases engine lathes and other machines formerly used, for service upon other work.

## Small Files for Difficult Places

By Harry C. McMillan

Having occasion to work out some small aluminum coreboxes and not having suitable files and riffles for the purpose, I made the tools shown herewith.

A piece of drill-rod shaped as shown at *A* was set in a file handle of convenient size. A small hole was




*The holder and files*

drilled for some distance into the rod, and a slot made across the end by means of a drill file. The width of the slot is equal to the diameter of the hole.

Bits of broken files of various shapes and sizes were prepared by having bent wires soldered to one of the surfaces. The wires were of such size as to fit nicely in the holder, and, as the bend of the wire entered the slot in the holder, the tools could not turn over when in use.

By having a sufficient number of different shapes and sizes of file bits and by bending the wires to whatever angles may be necessary, almost any otherwise inaccessible place may be reached.

## Roll-Over Jig for Rear-Axle Housings

By Chester H. Franklin

The rear-axle housing of the modern automobile presents several difficult machining problems on account of the various protuberances necessary to hold the brake rigging, spring clips, etc. The illustrations show a roll-over jig for drilling rear-axle housings in the Marmon shop. Fig. 1 shows the jig in operation, with the brake end of the housing up. It also shows the truck on which the jig is mounted and the general construction of the jig.

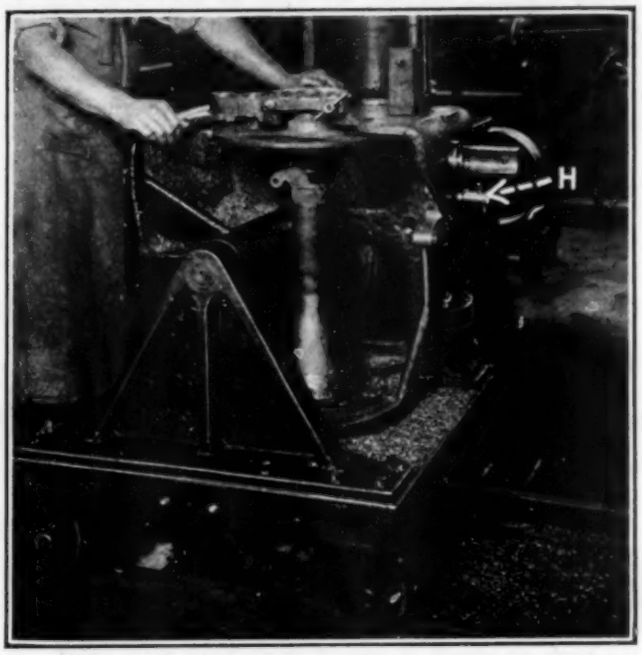



*Fig. 1—Roll over jig for rear axle housing*

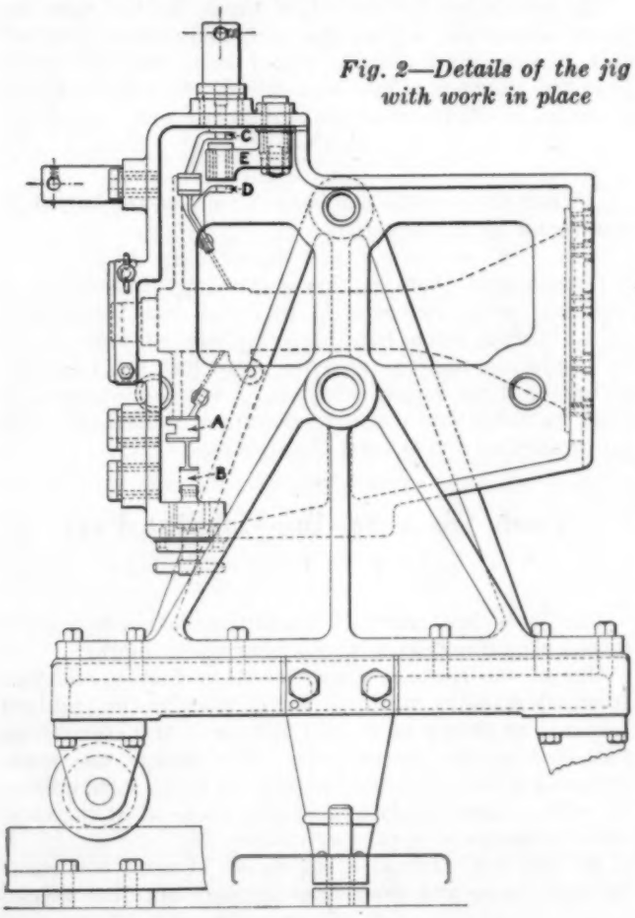



*Fig. 2—Details of the jig with work in place*

Four drilling operations are performed in the jig, as can be seen in Fig. 2. The brake shaft holes *A* and *B* are drilled, reamed and spotfaced; the holes for the shock absorbers are drilled, reamed, spotfaced and chamfered; the spring bracket is drilled and spotfaced and the ten holes by which the housing is bolted to the differential case, are drilled in the large flange. Fig. 2 also shows the outline of the housing in the jig and indicates the way in which the jig and the work roll over to reach the various holes from the vertical spindle of the drilling machine.

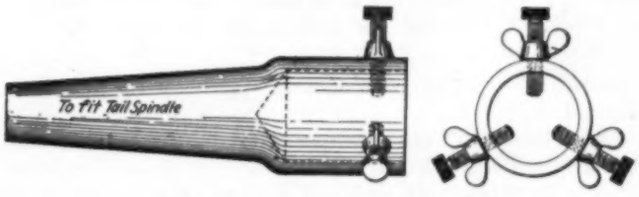
In drilling the holes *C* and *D* the guide *E* is swung into place by the handle shown at *H* Fig. 1, the guide holding the drill in line between holes so that both holes must line up. Unfortunately the part of the flange which carries these holes is not shown in Fig. 1, being hidden in the shadow up under the jig. As will be seen the drilling machine in the illustration is one of a gang to which the truck carrying the fixture moves for this operation.

## Truing Work Having Damaged Centers

By H. M. James

In the general repair shop of which I am foreman there is a great variety of work to be done, and one job that frequently comes to us is the turning of commutators upon the armatures of automobile starters. More often than not the centers of the armatures have been damaged so that in order to secure a concentric job it is necessary first to recenter the work. To eliminate the expensive process of recentering I devised the little tool shown in the cut, which I call a "tailstock steadyrest."

It is made from a piece of soft stock with one end turned taper to fit the hole in the tail spindle. The




*A "steadyrest" for the tail spindle*

large end is bored to a diameter of 2½ in. for a depth of 3 in., and about ¾ in. from the open end the three screws were tapped in radially. These screws are of bronze and are fitted with wing locking nuts. The boring can be done very conveniently, as the taper shank will, of course, fit the live spindle as well as the tail spindle.

When an armature with damaged centers comes along, the long end is chucked and trued up with an indicator. The device is placed in the tail spindle with the open end enclosing the short end of the armature, close to the commutator, and the bronze bearing-screws adjusted as would be the jaws of a steadyrest. This method insures that the commutator will be turned true with the bearings, which is very necessary. Any other work having damaged centers can be trued in the same way.

## Cutting a Scroll Under Difficulties

By J. Davies

We recently had occasion to replace the scroll-plate of a universal chuck on one of our production machines and, in order to reduce to a minimum the time the machine would be obliged to lie idle while awaiting repairs, we decided to make the new scroll-plate ourselves. The scroll was of ⅜-in. pitch, with a square thread.

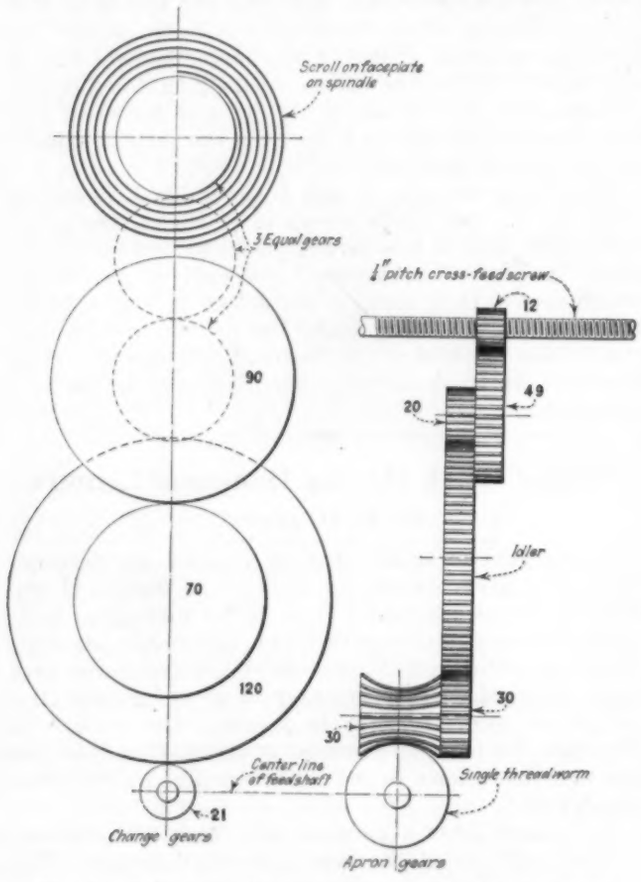



*Fig. 1—Diagram of apron gears and change gears to cut ⅜-in. pitch*

We "sized up" the machines that might be available for the job and selected an old timer of an engine lathe that was fitted with exposed change gears. Our first job was to compute the ratio between the leadscrew and the cross-feed screw of the carriage in order to determine what change gears to use, and for this purpose we got our data by crawling under the lathe with an extension lamp and laboriously counting the numbers of teeth in all the gears involved behind the carriage apron.

The feed shaft carried a single-thread worm which meshed with a 30-tooth worm gear, on the same stud with which was a 30-tooth spur gear that drove a 20-tooth pinion through an idler, as shown in Fig. 1 at the right. Upon the stud with the 20-tooth pinion was a 49-tooth gear meshing with a 12-tooth pinion on the cross-feed screw. The number of turns of the cross-feed screw for one turn of the feed shaft was, therefore,

$$\frac{1}{30} \times \frac{30}{20} \times \frac{49}{12} = \frac{49}{240}$$

The pitch of the cross-feed screw was ¼ in. and this gave a cross-feed movement of $\frac{1}{4} \times \frac{49}{240} = \frac{49}{960}$, for one turn of the feed shaft.

To cut a ⅜-in. pitch, the ratio of the change gears was $\frac{3}{8} \times \frac{960}{49} = \frac{360}{49} = \frac{90}{70} \times \frac{120}{21}$, as shown at the left in Fig. 1, but as we could not obtain all of these gears we compromised by using the combination $\frac{90}{30} \times \frac{100}{40}$. The cross-feed per revolution of the spindle with these gears was $\frac{90}{30} \times \frac{100}{40} \times \frac{1}{30} \times \frac{30}{20} \times \frac{49}{12} \times \frac{1}{4} = 0.383$ in.

As this error was too great to be tolerated, we overcame it by setting the cutting tool above the center of the work as shown in Fig. 2, and altering the width of the tool to suit.

The calculation for the height which the tool must be raised above the center, in order to produce a spiral with a ⅜-in. pitch on the center line, was calculated from the diagram. The diameter of the outside circle is the mean diameter of the scroll-plate and

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

When the angle $A$ had been calculated, the height $X$ was found by the equation

$$X = b \sin A = 3.6875 \times \sin A$$

I am aware that by this method we introduced a technical error, owing to the fact that each thread was of a different pitch, but this error was so slight as to be negligible, and by ignoring it we had the job completed in three hours, whereas if we had stopped to make patterns and cut new gears we would have held up production for at least three days.

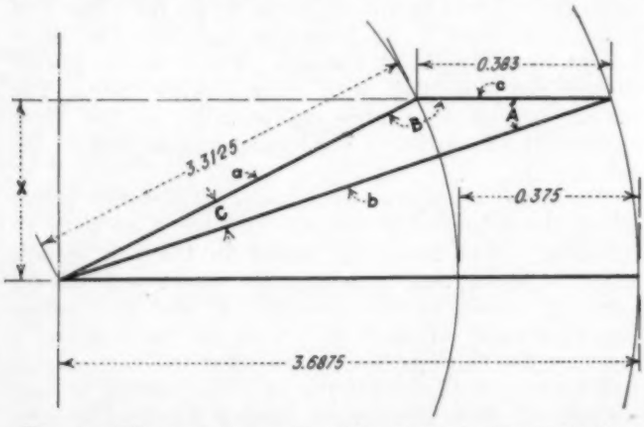



*Fig. 2—The tool was moved the distance X vertically*

## Tools for a Sewing-Machine Part

By F. O. Hickling
Newark-on-Trent, England

The tools and methods here described are applied to the manufacture of presser-bar guide-blocks.

One of the parts is shown at $A$ in Fig. 1, and was formerly made by milling a bar of stock to the required contour, as shown at $B$, and sawing it transversely as indicated by the dotted lines. The change was made by using a bar of smaller section, as at $C$, form milling the pieces transversely and cutting them off at the same time by means of a gang of cutters.

By the new method a saving of 1¼ min. was made on each piece and there was 50 per cent less wasted

metal because of the shorter length of the cut-off. The method involves the use of but one milling fixture in place of the three formerly employed.

The pieces are made from ⅜x1½-in. cold-rolled stock, and the first operation consists of cutting off pieces 12 in. long on a stock saw, this length being sufficient

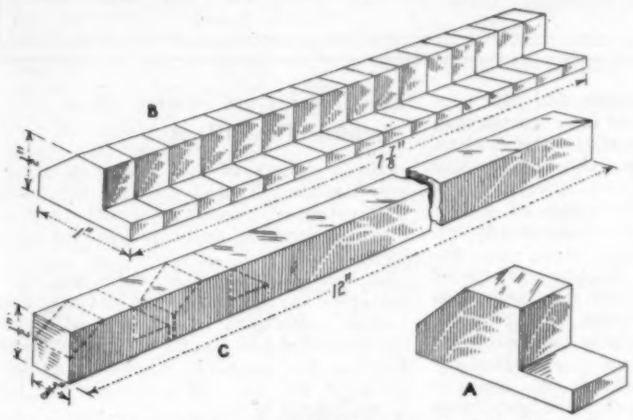



*Fig. 1—Old and new methods of producing the piece*

to produce ten of the parts, including scrap allowance. The second operation is form milling, for which the set-up shown in Fig. 2 is employed. The holding fixture is a standard milling machine vise with special jaws.

The bar lies between the jaws, resting upon pins driven into the fixed jaw and passing freely through holes in the movable jaw. These pins form an ideal

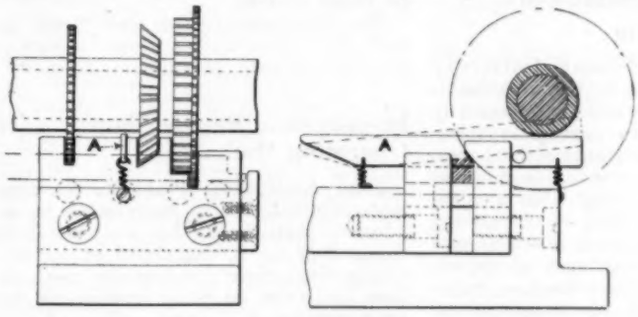



*Fig. 2—The fixture for the milling operation*

support as chips are not likely to lodge upon them and thus affect the vertical location of the work. The overhanging, beveled portion of the fixed jaw forces the bar down upon the supporting pins. Both jaws are cut away where necessary for the passage of the cutters.

The narrow cutter to the left on the arbor makes a slot in the bar that, in conjunction with the lever *A*, locates the piece for the succeeding cut. The lever is a piece of steel of the same thickness as the cutter that makes the slot, and it fits closely in slots across the tops of the vise jaws. Unless it can enter the slot in the bar left by the cutter just mentioned, which indicates that the bar is correctly located for the next cut, it cannot take up its proper working position but will remain elevated, as shown by the dotted lines at the right, and interfere with the passage of the cutter arbor.

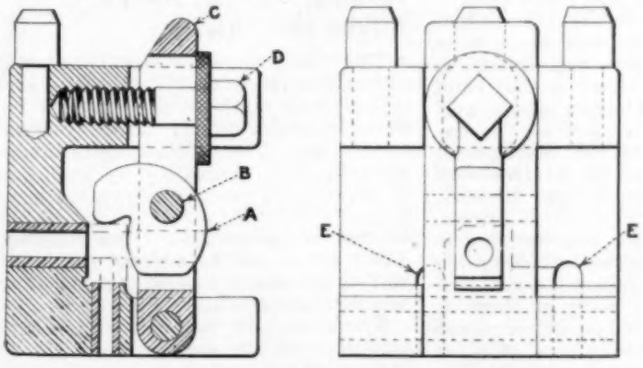



*Fig. 3—The drilling jig*

The locating stop at the end of the vise jaws may seem superfluous, as the lever and slot are the determining factors, but this stop was added afterwards as it was found to save a considerable time hitherto wasted by the operator in "feeling" for the slot in the bar with the lever.

In the drilling jig, Fig. 3, the pieces rest upon two hardened steel faces in which are located the respective drill bushings, and is clamped thereto by the equalizing lever *A*, swinging upon the pin *B*, which is let into the latch *C*. Pressure is applied by means of the screw *D*. The large hole through the outer end of the latch, through which the head of the screw passes easily, is covered by a slip-washer. To open the jig the screw is slackened and the slip washer removed, allowing the latch to be swung outwardly.

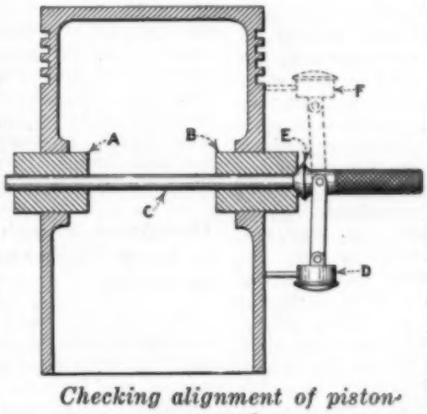
The piece is located lengthwise in the jig by means of the pins *E*, between which it lies. The lever *A* delivers its pressure equally in both directions, and the reaction from the pressure of the drill is merely transferred to the other bearing surface.

The tapping operation presents no difficulties.

## Checking Piston-Pin Alignment

By Douglas P. Muirhead
Glasgow, Scotland

When inspecting pistons of the Diesel engines it is important that a reliable check be made to find if the piston-pin holes have been machined at right angles to the body of the piston. The gage shown in the sketch is cheap to make, and with it very dependable results may be obtained. The cast-iron bushings *A* and *B* are ground 0.002 in. taper on the outside diameter and a light drive fit for the piston-pin holes. The taper is to allow for variation in hole diameters between high and low limits. A 1½-in. diameter hole is reamed through each bushing. A ground bar *C* fits accurately in the reamed holes in the bushings and carries a dial gage *D* at the end of the extension. It was found in practice that the most accurate results were obtained when the bar had a cone-shaped bearing at *E* in one of the bushings.




*Checking alignment of piston-pin holes*

To use the device it is first placed in the position shown at *D* and the dial set at zero; after which it is turned through 180 degrees to position *F*, when any error of alignment may be read from the dial.

# Technical Abstracts

## General Motors Research Laboratory

This is a most interesting article with photographs of the laboratories and some of the shops. The main building is over 1,000 feet long by 4400 feet wide. One of the departments is just a big garage, conducting road tests of automobiles. A typical road circuit is 86 miles of sand, mud, dirt, paved boulevard, city streets, good country roads, poor roads, up hill, down hill, level road. Automobiles are given the best attention but are driven hard and relentlessly until they break down. Each car in three months is run 25,000 miles, and is then taken down for complete examination and measurements for wear. A very complete chart is kept of all its ailments and troubles during the time.

With this article could be read with profit one on page 34, dealing with the British Bureau of Standards, also accompanied by many photographs. *Scientific American*, July, p. 8.

## Scientific Management in Other Countries than the United States

This is a paper presented by Frank M. Gilbreth and Lillian M. Gilbreth, based on a mass of foreign literature, observations made during conferences with visitors from abroad, correspondence extending over the past fourteen years or more with many countries, and data collected during more than a dozen trips abroad.

There are many scientists, especially research men, and technical writers interested in scientific management, but there are comparatively few manufactures. There are many satisfactory installations in many countries, some made by American consulting engineers. Unfortunately there are many young men from Europe who have had a comparatively short experience in one or two American plants and have returned to their own country with the firm conviction that they have learned scientific management. The Gilbreths state that perhaps no one thing has injured the reputation of American management methods so much as this return of young men to Europe who have only a smattering of the real fundamentals.

Twenty thousand copies of Taylor's "Principles of Scientific Management" have been sold in France alone, and translations of this have been made into most of the languages of Europe, and several of Asia as well. There is, however, a feeling that advances should be kept secret in plant operations, which works against the advance of industry abroad. Coupled with this is the conservatism of the workers and the need for advancing slowly. This indicates a distinct call for this country to make plain the principles and practices advocated, and the need for extreme care in changing any part of the mechanism, and also of the place and value of time study, motion study and other methods of measurement. In a list of different countries which have either adopted scientific management ideas or are studying them, we find a society of Chinese and American engineers in China who are studying management.

Later on in the article the Gilbreths deal with the question of standardization. Sixteen countries at present handle this through standardizing organizations, and in Russia, for example, there is a strong and deep interest in this work, as well as in applied psychology and vocational guidance. It is stated that the Russian movement is a nation-wide educational campaign, embracing farmers, all government employees and school children. —*Bulletin of Taylor Society*, June, p. 132.

## Fundamental Economies of Materials Handling

Professor M. L. Begman, University of Michigan, discusses the advantages of handling materials mechanically without reference to particular types of equipment. He maintains the necessity for the substitution of mechanical handling of materials for labor and believes it an economy that will be gained quickly. A specific case is taken up and deals with many advantages which are that production is increased, greater speed is obtained in the movement of the product through the plant, labor expense is reduced, floor space is economized and overhead expense decreased. One point which should not be lost sight of is that the cost of financing a business is decreased due to the small investment carried.—*Mechanical Engineering*, July, p. 405.

## Designers Should Be Compelled to Keep Their Own Cars in Repair

Baudry de Saunier, Editor-in-Chief of *Omnia*, asserts that one of the main reasons why cars are inconvenient to adjust and keep in repair is that chief designers have underlings and expert mechanicians to take care of the mechanical work during the development period. If they had to do the work themselves there would soon be little cause for complaint. In this connection he points out the extreme desirability of at least making all designing engineers drive their cars constantly. In France, however, many of them do not even know how to drive, which probably means that many of them cannot afford to keep a car. *Omnia*, June, p. 35.

## The Inspection System in a Machine Tool Plant

H. S. Riggs of the Lodge & Shipley Machine Tool Company describes the system of checking the accuracy of parts, assembled units and of the complete lathe.

Before any work is done the raw material is inspected for defects and before completing the batch of parts the operator has the first piece checked against the detailed blueprint accompanying the job. If approved the job is proceeded with.

There is a central inspection department where all parts are carefully inspected. After the units are in the assembly department, an inspector goes to the job and checks it. The complete lathe is then put through about thirty-six different steps, through most of which the lathe is belted up on a motor and run under operating conditions. Alignment and accuracy of the various headstock and tailstock can very easily be found in test.

Some inspection cards and forms, as well as illustrations are shown.—*Machinery*, July, p. 835.

## Investigating Repair Shop Operating Methods

John A. Butler, president, National Automobile Dealer's Association in an address stated that his association is conducting an investigation of maintenance department operating methods, both as to the adoption and use of flat rate systems of charge to the customer and piece work pay to the mechanic. This is a phase of study that is being constantly carried on in the hope of improving the class of work done in the shop, maintaining the standard of compensation to mechanics at its highest, as well as insuring satisfaction to the customer and profit to the dealer. *Motor Age*, June 19, p. 10.

## Universal Machine Tool for Turning, Planing, Boring, Milling and Shaping

The Magdeburger Werkzeug Machinen-Fabrik A. G. brings out a sort of universal machine tool intended for garages, small repair shops, colonial service, etc. The machine looks fundamentally like lathe, but by mounting of various appliances on the lathe ways it can be turned into a tool for all the operations mentioned in the heading. The machine can be adapted either for belt or for electric drive, but can also be operated by means of a foot treadle.

There are half tones and line drawings showing the arrangements for all the various operations to be performed. *Die Werkzeugmaschine*, May 15, p. 157.

## Who Can Hire Management

Henry S. Dennison, President of the Dennison Manufacturing Company, raises the points—What is managing—Who manages— and— Who can best choose managers. He gives first a picture of a business concern as a closed and intimately intermeshed circuit of psychological forces, continuous, dynamic, through and among three principal groups of human beings—investors, workers, customers—using as conductors the equipments, materials, services and money which to external appearances constitute the reality of the company, and states that managing does not at all consist to any significant degree in giving orders. Order giving is to foremanship what order taking is to a salesmanship. He analyzes management under the following classifications—understanding, devising, persuading, and takes a specific case. Understanding is made up of observing and evaluating. Devising is made up of conceiving and analyzing, and finally, contriving. Persuading is made up of directing, teaching and inducing. Since every one shares to some degree managerial authority, the question of hiring management becomes in its first form the joint question of choosing and correctly assigning functions. Usually an industrial concern will have its board of directors choose the manager.

Mr. Dennison brings up two other possibilities, namely, choosing by customers and choosing by workers. In the latter case he pictures the advantages of the workers who have within their group about as much inside knowledge as exists, in addition to a greater sense of appreciation and understanding of the nature and interests of the investors' group and customers' group than have either one of these two others in relation to their alternates.—*Bulletin of Taylor Society*, June, p. 101.

## Tinning of Cast Iron

The tinning of cast iron requires a very painstaking cleaning and preparation process, consisting of sandblasting, rattling, cleaning with hydrofluoric acid, immersion in hot potash or soda lye, washing, new rattling, this time with hydrochloric acid and sal ammoniac, and finally storing under water. Before the actual tinning the pieces are immersed in hot soda solution, very weak hydrochloric-acid solution, finally in a bath of chloride of zinc (should possibly be tin), and at last in melted tin, the surface of which is covered with chloride of tin. The tinned articles are cooled in oil.—*Das Auto*, June, p. 392

## Krupp Balancing Apparatus

The firm of Krupp in Essen seems of late to have taken a great deal of interest in balancing and balancing devices, and has taken out a number of patents in this field. By the use of a very carefully designed gravity balance static errors of the center of gravity are first eliminated. It has been found that an excellent static balance in many cases is all that is necessary. Nevertheless the firm has also developed three types of dynamic balancing machines, one especially suited for smaller work and for quantity production methods. With the aid of this apparatus the determination of the critical speed becomes superfluous. *Das Auto*, June, p. 390.

## Heat Treatment of Cast Iron

J. W. Donaldson writes on the behavior of such parts as piston heads for large Diesel engines where the temperature sometimes reaches over 1,000 degrees F. A number of tabulations are given showing the effects of various heat treatment experiments and the effect of chromium and nickel additions.

The conclusions arrived at are as follows:

1. That low temperature heat treatment produces decomposition of carbide with corresponding decreases in the strength and hardness.
2. That increasing manganese content produces a more stable carbide.
3. That the addition of a small amount of chromium has a still greater effect in stabilizing the carbide.
4. That nickel in small quantity diminishes the stability of the carbide and produces rapid decomposition on heat treatment.

The experiments were carried out at the Scotts' Shipbuilding and Engineering Company in Scotland.—*Iron Age*, June 26, p. 1858.

## Solution to Remove Paint

In an article dealing with quick painting it is stated that paint can be removed quickly by the use of a solution of alkali, lye and water, using one pint of alkali in powder form to four gallons of ordinary water and to the mixture adding a 12½ ounce can of lye. This is boiled and the solution applied to the surface of the car with a mop made of gunny-sack, allowing time for the solution to soak in the paint. The job is rinsed off with a solution of vinegar and water, the vinegar to neutralize the action of the lye. The job is then ready for the paint shop.

In the same magazine on page 39, it is stated that a pint of paint remover solution dissolved in a large container holding hot water and live steam turned into the solution will also remove the paint quickly. The solution is sprayed upon the job through a hose for fifteen to twenty minutes stripping the enamel and paint at once down to the metal. The Dodge car enamel however is immune to this kind of treatment.—*Auto Trimmer and Painter*, June, p. 35.

## Industrial Paint Problems

Too many plants are given their first and last coat of paint when the establishment is built. Paint is a definite protective factor as well as a productive factor and its use should not be stinted too much. From the economic point of view alone, paint is of such value that it should be increasingly used and it has in addition a favorable reaction on the operating staff.

This article by Roy C. Sheeler gives some illustrations of what paint can do under certain conditions.—*Industry Illustrated*, July, p. 27.

## Novel Industrial Safety Contest

The American Rolling Mill Company, Middletown, Ohio, has staged a contest with four Newport, Kentucky, concerns, the Newport Rolling Mill Company, Andrews Steel Company, Globe Iron Roofing & Corrugating Company and the Newport Culvert Company, to see which would have the fewest accidents. Certain definitions were laid down as to what constituted accidents, and the contest started. Practically every one who entered the plant, visitor or workman, was compelled to wear a badge, showing he was able to take care of himself and that he was inoculated with the safety virus.

All sorts of stunts were carried out to vizualize results. For an example a large black cat was placed at the entrance by the workmen and as each day passed without an accident a white strip was painted on it. "Old Man Carelessness" much bandaged, and spotted with red paint limped through the plant on crutches followed up and chased by a neat and natty workman representing Safety First. Later on dummies of the old man were drowned and buried.

The result of these various efforts show that the Newport Rolling Mill Company had a total of two slight time lost accidents as compared with fifty-three for four months previous and one such accident at the Andrews Steel Company, compared with seventy-three previously. For the month of June to the date of June 12 there were no accidents in any of the plants so far.

One important direct benefit is there has been marked improvement in the quality of the work put out by the men and production is maintained better in all departments, the only department suffering from loss of output being the hospital, where treatments have been cut down sixty per cent or more.—*Iron Age*, June 26, p. 1850.

## F. J. Worm Gears

Colonel H. W. Alden and C. E. Dwyer have compiled a booklet dealing with the important phases of worm gear contact and particularly with the new type of tooth now being employed for trucks and buses. In this particular type the worm teeth have involute sides, whereas the wheel teeth have straight sides, just the reverse of the David Brown type introduced by the Pierce-Arrow. The F. J. contact is much greater than the David Brown type and this condition permits a very much heavier load to be carried.

The characteristics show large area of tooth contact, reduced rubbing velocity, less friction, higher efficiency and shorter worm.—*Timken Detroit Axle Magazine*, June, p. 386.

## Material Handling

This article by Matthew W. Potts is of interest for its photographs illustrating the handling of a large number of materials. There are figures, showing conveyor systems handling engine parts, others handling stamped metal body parts. There are also several illustrations of the handling of coal and other bulky materials.—*Industry Illustrated*, June, p. 14.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

## *A Progressive Equipment Buyer*

WHY do some shops succeed where others with equal opportunities fail? There may be many answers to the question, of course, but here is one of them: because the man charged with buying the equipment for the shop is progressive.

In our travels we recently occupied the position of respectful listener while a superintendent explained the policy according to which he specified the tools bought by his company. One example tells the story.

Shortly before we saw him a small battery of production machines of well-known make and recent design had been installed. "I told the president," said the superintendent, "when he bought those machines for me that I had to have them because they were the best to be had for that particular job. But I also told him not to be surprised if I asked to have them declared obsolete before the first of the year to make room for something better. I know of one or two things now coming along that will make those machines out there look foolish, but I couldn't wait for them and in the meantime the ones I ordered will pay for themselves and more besides."

This superintendent works for one of the most successful and rapidly growing companies in its line of business. From our point of view, his policy on new equipment has been no small factor in that success.

## *The Cost of Maintaining Machine Equipment*

THE reduction of direct labor costs has received so much attention during the past few years that most of us have neglected, if we have not overlooked entirely, some of the other items that enter into the total of the product. One of these items, which often assumes large proportions, is that of maintaining our machine equipment.

There are various ways of looking after this important item of expense. Some shops have elaborate systems of reports as to machine conditions, when repairs should be made; what they cost and when machines should be replaced by newer and better ones. The average shop however has almost no system for handling work of this kind, or accurate records as to what such repairs cost. In some places a gang of repair men keep machines in operation, but no record is kept of the machines or the cost of each repair. The expense of the gang goes into the overhead in a lump sum and no questions are asked.

Such a method is simple and avoids voluminous reports, most of which are never read or digested. Under such a plan, however, there is no record of the performance of different machines which would be of value in selecting new equipment. Some information can usually be had from the foreman of the gang, but this is by no means a reliable guide when it comes to spending thousands of dollars in new machinery. A fairly complete record of the idle time and cost of repairs of the different machines in the shop, can play an important part in maintaining the productive machinery in an economical manner. Such a record can frequently help to solve the problem of whether to put in hand machines, semi-automatics or full automatics for certain classes of work.

One large establishment keeps a record of all major repairs and requires an estimate as to the probable cost before deciding whether to repair the machine or relegate it to the scrap pile. A large sheet is used on which a close estimate is made, the same sheet showing the actual cost of the different items, the time the machine is out of service and just what was necessary to put it into first class shape. These sheets give a good life history of each machine and are of great assistance in determining what to buy for new equipment.

Records can easily become burdensome and in too many cases they are never used. Many are realizing this and eliminating as many forms as possible so as to reduce paper work and unwieldly filing systems. But there is a happy medium.

As the question of machine maintenance is an important item in every shop, it would be both interesting and valuable to know how shops of different sizes handle repairs and how they keep track of the cost.

## *Encouraging Airplane Development*

THE announced proposal of the Ford Motor Co. to establish a large airplane landing field near the new administration building in Dearborn, Mich., just outside of Detroit, will be commended by all who are interested in the development of aviation. Landing fields with supply and service facilities are just as necessary to the airplane as the garage and service station are to the automobile.

It is reported that there is no intention on the part of the Ford Motor Company to go into airplane or motor building but that they simply desire to encourage aviation by providing facilities for users of airplanes.

It is to be hoped that other large concerns in various cities will follow this example and thus add greatly to the list of landing fields available for air traffic. But whether business firms can provide landing fields or not, they can use the air mail whenever possible and thus encourage a very practical application of the airplane as well as save time and money for themselves.

The need for adequate machine equipment is nowhere more strongly emphasized than in a recent report of the Interstate Commerce Commission regarding the cost of repairing locomotives. The report points out that, if the extra cost of having locomotives repaired by contract had been expended in securing new shop equipment, the railroads would be in a better position for handling future work. Whether the criticism of the methods of management is justified or not, the need of modern shop equipment is very clearly shown by the report.

# Shop Equipment News

## Porter-McLeod Engine Lathes

The Porter-McLeod Tool Works, Hatfield, Mass., is now marketing a line of engine lathes ranging in size from 15- to 24-in. swing. These lathes are designed to meet the requirements of modern shop practice, the beds being of extra heavy section and cross-ribbed at close intervals, the headstocks being webbed instead of the open pattern. The spindles have been increased in diameter, more powerful driving gear has been provided and many conveniences are supplied.

These lathes are made in five sizes with 15-, 16-, 18-, 21- and 24-in. swing, and various lengths of bed are furnished in each size as required. All sizes are made with three-step cones and double back-gears, giving nine changes of spindle speed. Back-gears on opposite ends of the quill are of different pitches to avoid all possibility of gear chatter. The double gear is on a separate sleeve splined to the quill, and is meshed with respective pinions by a lever-controlled sliding movement. Means are provided to prevent the meshing of opposed gears simultaneously. The four larger sizes of the lathe may be furnished with four-step cones, single backgears and loose change gears, if desired.

The spindles of the smaller sizes are made of high-carbon tool steel and, for the 21- and 24-in sizes, of crucible steel forgings. The journals are of ample section and are carefully ground to size.

The hole through the spindle is 1⅝ in. in diameter on the three smaller sizes, and on the 21- and 24-in. lathes the diameter of the hole is 2¼ inches. The live center is carried in a removable bushing. All tapers of centers and bushings conform to the Morse standard.

The tailstock is of the cut-away pattern and is secured to the shears by two wrench-operated binding bolts placed in a convenient position for operating. Crosswise adjustment is provided for turning tapers, this adjustment being in addition to the regular taper-turning attachment which can be supplied for all lathes, if desired.

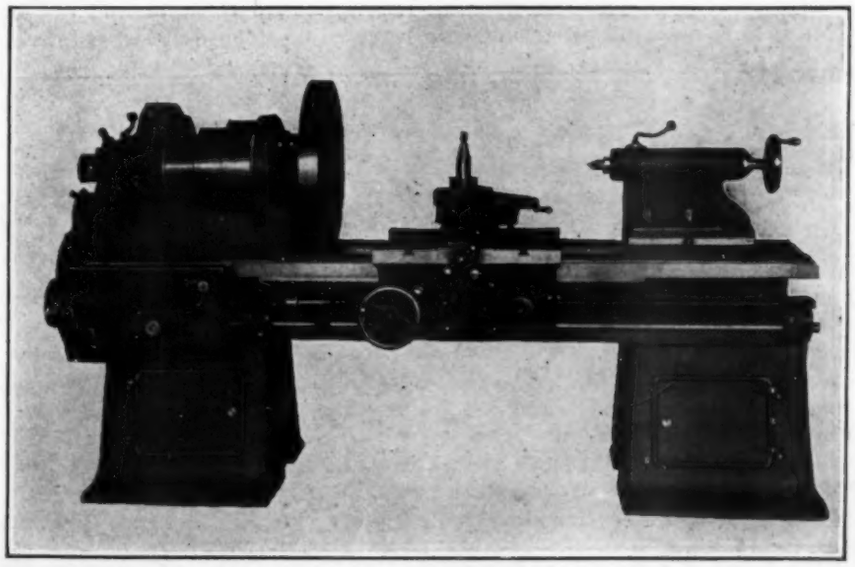
The carriages have long bearings upon the shears, the bearing surfaces being carefully scraped and fitted by hand. The aprons are of the double-plate type. The traverse and cross-feeds are independently operated and are driven through separate gearing. The traverse racks and pinions are of steel, and the pinion is so mounted that it may be withdrawn from the rack, leaving the traverse handwheel idle when cutting threads.

The compound slides are designed to swing clear around and clamp in any position. The bases of the compound slides are graduated. All the carriages are provided with thread-dials. The locknut is operated by a lever on the outside of the apron.

All of the lathes are equipped with quick-change gearing covering the usual range of commercial pitches, including 11½ and many fractional pitches. Two levers control the pitch and the positions of the respective levers are plainly indicated by an index plate. Provision is made in the driving train for a compound stud, for use if unusual fractional or very fine pitches are to be cut, as in experimental work.

The leadscrew and feed rod are independent and the change from one to the other is made by the small lever at the upper right corner of the gearbox. When one is engaged the other is idle.

All gearing is covered by rigid guards, so attached that they may be lifted or swung out of the way without delay if it becomes necessary to inspect the gearing. The weights of the machines with 10-ft. beds vary from 1,800 lb. for the 15-in. to 4,600 lb. for the 24-in. lathe.



*Porter-McLeod Engine Lathe*

## United American Metals Corp. "Diesel Marine" Babbitt

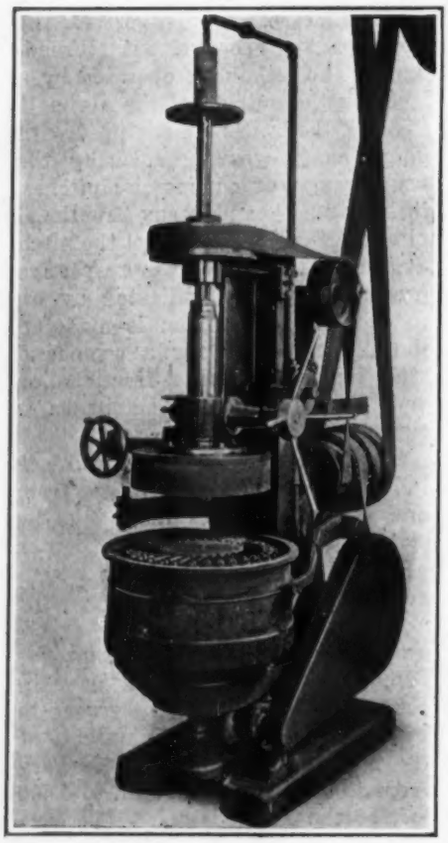
A brand of genuine babbitt known as "Diesel Marine" is now being marketed by the United American Metals Corp., Diamond St. and Meserole Ave., Brooklyn, N. Y. This babbitt is made according to government specifications for use in the Diesel and other types of internal combustion engines.

The material is alloyed by the Stanley process, in which the ingredients are separately melted and continuously agitated for 24 hours. This keeps the tin within the proper temperature and insures homogeneity.

# Mirra Lapping Machine

A lapping machine for cylindrical work, known as the Mirra lapping machine and shown in the accompanying illustration, is now being marketed by the Reed-Prentice Co., Worcester, Mass. The machine is especially adapted for the lapping of automobile piston pins and is applicable to all of the standard styles of pins.

A number of piston pins are placed loosely on a quick-loading spider, located between two lapping wheels that rotate on a vertical axis. The wheels rotate in opposite directions and at slightly different speeds. The illustration shows the spider in the loaded position with the pins resting on the lower wheel. In operation the upper wheel is pressed against the pins and the difference in wheels speeds causes the pins to rotate between the lapping wheels and creep slowly in a circular path.



*Mirra Lapping Machine*

The projecting arms on the spider are not located radially and consequently the pins have combined rotating and sliding motion between the wheels. The spider rotates on an eccentric so that the work has three distinct motions in relation to the wheels. First, the creeping of the work caused by the difference in wheel speeds; second, the sliding rotating action on account of the work not being located radially in the spider; and third, an in-and-out sliding motion caused by the eccentric mounting of the spider.

It is stated that this method gives a highly polished product that is free from grooves, and that the roundness, taper, and diameter of the finished parts can be kept within 0.0001 in. of the required dimensions.

The lapping wheels are driven independently from a pulley shaft at the rear of the machine, and are mounted in separate heads on a heavy column. The lower wheel is not adjustable in its head but the upper one slides vertically, this vertical movement being controlled by means of a pilot wheel at the side of the machine. The spindle journals are hardened and ground and the thrust of both wheels is taken by ball thrust bearings.

A double-end diamond wheel dresser is located at the left-hand side of the machine, so that both wheels can be dressed independently by the same mechanism. The coolant is pumped from a tank in the base of the machine to the wheel spindle from which it flows over the work. When the upper wheel is lowered on the work a guard rises automatically and prevents the throwing of the coolant by the wheel.

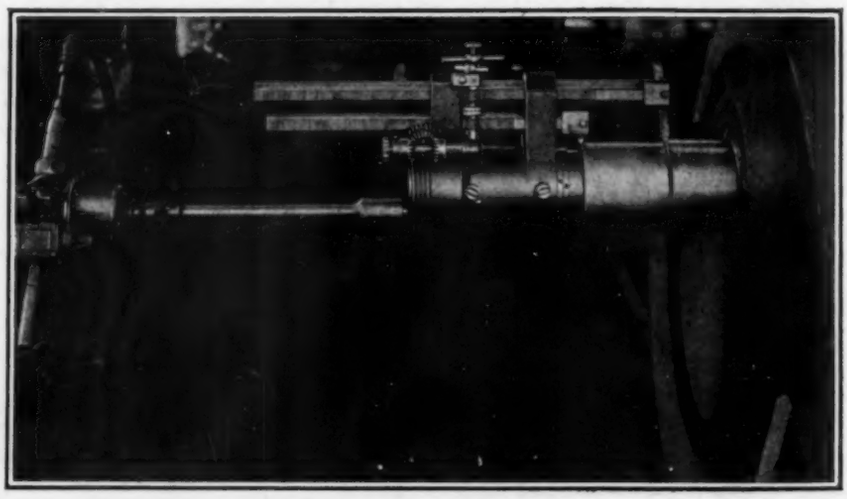
# American Portable Crankpin Lathe

A portable machine, known as the American portable crankpin lathe, for turning locomotive crankpins in place in the driving wheels, is now being marketed by C. E. Marsh, 436 Hemphill Ave., Atlanta, Ga. The accompanying illustration shows the device in operation, the driving power being furnished by a portable air motor.

The body of the machine consists of two parts, a spindle attached to the end of the crankpin and a rotating cylinder that carries the tool bars and their feeding mechanism. The hole in the spindle is threaded to fit the threaded end of the crankpin, the diameter of the spindle hole being larger than the largest crankpin, so that an adapter can be interposed. This arrangement makes the device adaptable for work on crankpins of all diameters.

The end of the spindle next to the crankpin is threaded for thrust collars and the outer end is flanged to hold the rotating cylinder in position. This flange is threaded on its outside diameter and acts as a worm to drive the feed mechanism for the boring bars. This end of the spindle also carries the driving gears that mesh with an internal gear in the rotating cylinder.

The rotating cylinder has two arms that are bored to fit the tool bars. The bars are fed through these holes and the outer arm also carries the gearing for the feed mechanism, as shown. The feed is automatic and constant and can be reversed or stopped at any point. A



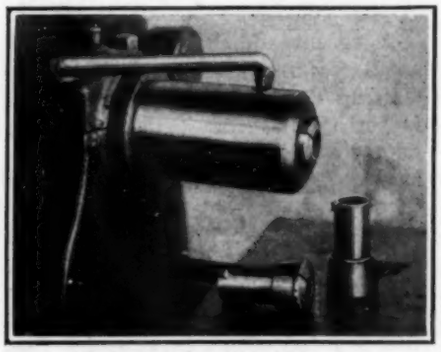
*American Portable Crankpin Lathe*

combination worm and bevel gear meshes with the threaded flange of the spindle and can be engaged with either of two bevel gears on a horizontal shaft, giving the two directions of feed. A worm on the inner end of the vertical shaft meshes with a wormwheel on a vertical shaft that carries the driving pinions for the tool bars. The pinions mesh with racks attached to the bars.

The tool bars are independent of each other and are interchangeable. Each bar has a separate feed control and the feed of either bar can be stopped at any point. The range of the device is for crankpins from 3 to 11 in. in diameter and up to 20 in. in length. With the tool bars illustrated the machine weighs 126 pounds.

## Strobl Collet Chuck

A self-contained collet chuck that can be attached to the machine in the same manner as the ordinary chuck has recently been placed on the market by the Universal Metal Products Co., 1134 W. Lake St., Chicago, Ill. The chuck consists of three



*Strobl Collet Chuck*

pieces and is simple in construction, consisting of a body into which is fitted a steel collet actuating ring, and the collet.

The collet is located in the chuck by inserting it and then turning it until the lugs, one of which can be seen on either side of the collet, engage the ring. The turning of a screw in the chuck body by means of the wrench shown in the illustration, operates the actuating ring of a cam movement and draws the collet in. No draw-in tube is used, the entire mechanism, with the exception of the wrench, being contained in the body of the device.

All parts are made of steel, hardened and ground, and are interchangeable. The chuck can be furnished to screw onto the nose of the machine spindle, as shown in the illustration, or with a flange so that it can be attached to an adapter. The chuck is made in two sizes, No. 1 having a capacity of from $\frac{1}{8}$ in. to $\frac{3}{4}$ in., and No. 2 having a capacity of from $\frac{1}{4}$ in. to 1 inch.

# Baush Heavy-Duty Horizontal Multiple-Spindle Drilling Machine

The line of horizontal multiple-spindle drilling machines manufactured by the Baush Machine Tool Co., Springfield, Mass., has recently been augmented by the addition of the heavy-duty machine illustrated. This machine is of the double-head type and is adapted for all sorts of heavy drilling.

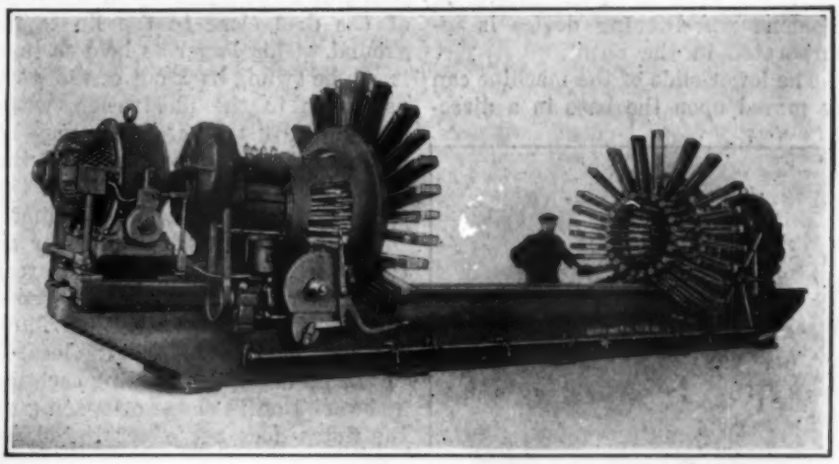


*Fig. 1—Baush Heavy-Duty Horizontal Multiple-Spindle Drilling Machine*

The machine has capacity for 24 drills 1 in. in diameter in each head and the heads are built either round or rectangular. The round heads range up to 36 in. in diameter and the maximum size of the rectangular head is 25 x 48 in. The bed illustrated is 29 ft. long, cast in one piece, and shorter beds can be furnished, if desired.

Each head can be equipped for fast approach and return, operated by a controller *A*, Fig. 2, mounted on the front of the head and controlling a small reversible motor at the rear. This motor drives through a friction safety clutch, so that the drills can be brought solidly against the work before the feed is thrown in. The rapid approach and return is interlocked with the feed, so that neither can be engaged simultaneously with the other. The feed is engaged by the lever *B*, Fig. 2. Each head is driven by a 27-hp. variable-speed motor, a push-button station *C* and a speed variator *D* being provided to control the operation of the motor. It will be noted that all electrical controls are conveniently located.

The complete machine is said to be capable of driving forty-eight 1-in. drills through cast iron at the rate of 3 in. per min. The spindle arms allow the centers of holes to be spaced at a distance equal to the diameter of the spindle, and ample spindle adjustment is provided. The

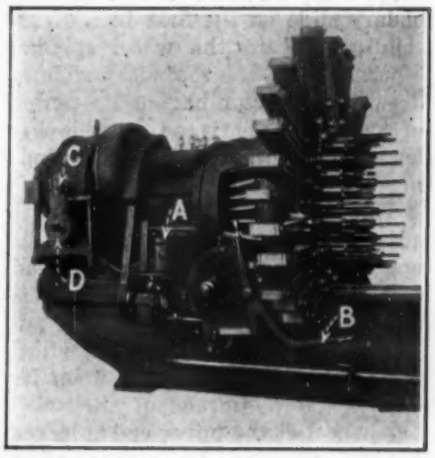


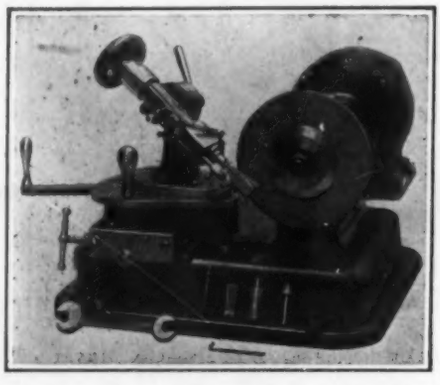

*Fig. 2—Close view of one head of Baush drilling machine*

bed and head castings have been designed to prevent vibration when drilling at full capacity. The weight of the machine as shown in the accompanying illustrations is 18 tons.

## Noyes Small Drill Pointing Machine

The Connecticut Cutter & Machine Works, Inc., 50 Remer St., Bridgeport, Conn., has brought out a small bench machine for sharpening twist drills from ¼ in. in diameter down to No. 60 drill-gage size. The machine is entirely self-contained and is driven by a ¼-hp. electric motor. A modified Oldham coupling is interposed between the motor and the wheel spindle, the spindle being carried in separate bearings to insure flexibility and free running. The wheel is 8 in. in diameter with a ¾-in. face. A diamond wheel-truing device is incorporated in the outfit.

The lower slide of the machine can be moved upon the base in a direction at right angles to the center line of the wheel spindle, and is actuated by a screw terminating in the T-handle at the left. The lever just above the T-handle moves a secondary slide on the first in a direction parallel to the wheel spindle. Mounted upon the secondary slide is a swinging sector having its center of swing as nearly as possible below the point where the actual grinding takes place.



*Noyes Small Drill Pointing Machine*

This sector is double with one part adjustable upon the other, and it is upon the upper part that the head carrying the drill-holding spindle is located. The holding spindle is adjustable to any angle in the vertical plane. It may be rotated upon its own center by means of the small handwheel at the upper end or locked against rotation by means of a spring actuated locking-pin when desired. The drill to be ground is held by a special spring collet that supports it close to the point. Collets are furnished with the machine to hold 64ths-in. sizes from ⅛-in. to ½-in., inclusive, and for the smaller sizes split bushing adapters are provided.

To locate the point of the drill with reference to the center of the arc to which the lip is to be ground a gage, shown in place in the illustration, is provided, in which the point of the drill abuts against an adjustable stop having suitable reference marks to correspond with various sizes of drills. To set the drill its point is inserted in the gage and while so held is pushed into the collet until the latter is met by the jaws of the gage, when the collet is tightened by turning the handwheel.

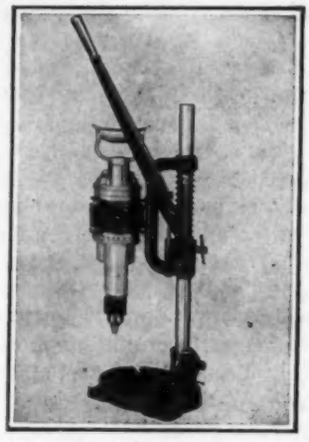
The drill is located circumferentially by means of a needle-point, or finger, resting in the flute of the drill close to the lip to be ground. This finger is held so that it can be swung back out of the way, as shown in the illustration, when changing drills. The finger may be made to bear close to the lip of the drill, and an adjusting screw in the arm bears against the bracket limiting the movement of the finger so that the latter always comes to rest in the same place without reference to the depth or location of the flute. By this means the drill is located by the lip itself for grinding each lip, and variation in shape or spacing of the flutes does not affect the clearances.

The drill point is ground to an arc, adjustment being provided not only for the length of radius but also for locating the centerline of the drill with reference to the center of swing. The angle of clearance may be thus changed readily to suit the diameter of the drill. This adjustment is effected by means of a knurled-head screw, shown in the illustration directly beneath the point of the drill, provided with graduation marks to indicate the range of sizes that may be ground at each setting.

## Neil & Smith "Ideal" Bench Drill Stand

The Neil & Smith Electrical Tool Co., 905 Broadway, Cincinnati, Ohio, has recently placed on the market its "Ideal" bench drill stand which will accommodate four sizes of portable electric drills. These sizes include the ¼-, 5/16-, ⅜- and ½-in. drills, the ¼-in. tool being shown attached to the device in the illustration.

No separate adapters are required, and the removal or change of any drill parts is unnecessary when attaching any of the drills to this stand. Two flat spring clamps are drawn up by thumbscrews and hold the drill rigidly against suitable V-shaped clamping surfaces. The bracket carrying the drill can be raised, lowered and swung around on the vertical column and clamped in the desired position. A spring supports the weight of the drill and bracket and an adjustable depth gage is provided on the bracket guide rod. The base is furnished with T-slots for clamping work.

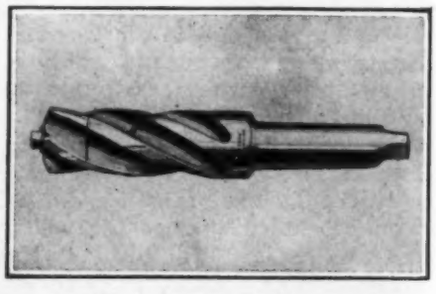


*Neil & Smith "Ideal" Bench Drill Stand*

## Gairing Type C Core Drill

A recent addition to the line of small tools manufactured by the Gairing Tool Co., Inc., Detroit, Mich., is the type C core drill for boring out or enlarging cored holes in castings or forgings. The tool is made in a range of five sizes.

The drill is of the built-up type and is designed to withstand the severe conditions of high-production operation. The cutting end of the tool is fitted with a taper shank that fits a recess in the fluted body. At the top of the tapered hole for the shank a recess for a hex nut is machined, and the draw-bolt for the cutter threads into this nut. The nut is held in place in the body of the drill by a spring ring in a groove. The cutters are removed by the insertion of a small drift pin.



*Gairing Type C Core Drill*

# News of the Week

## World Power Conference Speakers Discuss Industrial Progress

### *Many countries are represented at big meeting in England*

The following excerpts are from a letter to ELECTRICAL WORLD from its editor, Harold V. Bozell, who is attending the World Power Conference in England:

The British have seen to it that this conference was given a proper setting. The opening session was addressed by His Royal Highness, the Prince of Wales, honorary president of the conference. The Right Honorable, the Earl of Derby, president of the conference, presided. In reply to the Prince, Sir Joseph Cook spoke for the British Dominions and said that while, today, the world needs a balance of accounts rather than a balance of power, this could be attained only by developing power to the fullest extent and by seeking new sources of power. Never mind pre-war conditions, M. Guillaume, director of mines, France, replied for his country. Guido Semenza, Italy, replied for Italy and the rest of continental Europe, and said that this was probably the first time in the history of the world that one man had dared to speak for all the countries of Europe. Dr. Kamo, in replying for Japan and other Asiatic countries, said that it was impossible to eliminate competition between countries so long as one country depends on another for necessities. O. C. Merrill, secretary of the United States Federal Power Commission, replied for the United States and South American countries.

#### BANQUET SPEAKERS

The second impetus given by the British to the success of the conference was a formal banquet with a gorgeous setting with almost 800 guests. The Earl of Derby again presided. He said that most post-war conferences had been unproductive, but since this one dealt in realities it should have some definite and concrete results. Among others who spoke was Samuel Insull of Chicago, who pointed to this recognition of the great junior industry of the world. Dr. S. Z. de Ferranti, in remarking on the advance which electricity has made possible and comparing 1824 with 1924, said that 2024 will wonder at us of 1924 for the little use which we now make of electricity—and thus set forth inspiration to the further development of ways of making electrical service useful.

The American Committee also gave a dinner to the other delegations, on Thursday evening. One outstanding feature of this was an address by Dr. A. E. Kennelly, in which he said "the new understanding is that title to property is not absolute, but is accompanied by a trusteeship on the part of the owner looking to the betterment of society generally." And there are numerous other luncheons and receptions by the delegations of those countries which have several delegates here.

Altogether, there are about 125 American delegates in attendance, about 150 from Great Britain and about 160 from other countries.

#### VARIOUS BUSINESS SESSIONS

The business sessions during the first week have been devoted to the survey of power resources of the world; economic-financial, legal and government policy, aspect of power development; water-power development; steam power plants and equipment; and the preparation of fuels.

Discussion of the power resources served to develop the proposition that there is needed—and the conference may formulate some suggestion—some definite, uniform or standard method of stating the water-power capacity of a stream so that adequate comparisons may be made.

The inability of the European countries to finance adequately until there is a more stabilized currency in those countries was made most evident at the economic and financial sessions. The papers presented by some of the bankers brought this fact out most forcibly.

In discussing the social phases of power development, J. P. Noonan, United States, president of the organized electrical workers and representing the American Federation of Labor, stated unequivocally that labor stands ready to co-operate to the fullest extent in the development of power.

Of the papers presented, those by Sir Philip Lloyd-Greame of Great Britain and by Dr. Arthur T. Hadley, president *emeritus* of Yale, United States, were of exceptional strength and merit. The main point of Doctor Hadley's discussion was that all history has shown that, with an "experimental" industry such as the electrical—and such as railroads were seventy-five years ago—as compared with a standardized industry government does not make the best progress for the good of the people but that private industry does. Sir Philip made the point that it was government's function to make possible power development, and he brought the British experience forward to prove his point.

A representative from India said that recent experience with the absolute rigidity of rates and other controlling factors of utility development, under government control, showed the futility of government operation of businesses of that nature.

There were two very interesting sessions on steam power plants. The discussion here was directly very largely toward pulverized fuel and boiler construction. In the matter of the former, the principal questions were as to the American experience. There was also a most interesting session on turbines, in which there was a great deal of constructive discussion. This discussion was largely technical, having to do with possibilities of making slight increases in efficiency of the turbines and also of insuring maximum reliability.

Only four papers were presented at the session on illumination. Dr. C. W. Sharp of the United States said that he deplored that in a world power conference, devoted principally to the electrical industry, so little attention was paid to the subject of lighting, which accounts for so large a part of the revenue of the electrical power undertakings.

## What the Railroads Are Doing

Rumors of mergers were current in the financial districts this week. The Van Sweringen interests were talked of as being the prime movers with the Erie, the Nickel Plate and the Pere Marquette mentioned as the roads to be taken in with the other Van Sweringen lines.

The New York Central railroad placed an order for twenty-five locomotives with the American Locomotive Co. and an order for five with the Lima Locomotive Works.

The New York, New Haven & Hartford railroad ordered ten switching engines from the American Locomotive Co.

There was a decrease of more than 14 per cent in freight traffic during May when compared with the same month in 1923. During the first six months of the year there has been a decrease of eight per cent.

The Delaware, Lackawanna & Western railroad reported good earnings during June, although a slight decrease when compared with May or with June 1923. Gross revenues were around seven million dollars compared with $8,005,000 a year ago and $7,450,000 in May of this year.

On June 15 the Class 1 railroads of the United States had 11,453 locomotives or more than 17 per cent of the total number on line, in need of repair, an increase of 578 over those needing repairs on June 1.

# Automobile Makers Expect Increase in British Sales in August

## *Tariff removal may result in large motor car exportations*

One of the most important developments in automotive foreign trade in recent years is expected with the removal on Aug. 1 of import duties on non-commercial cars, motor cycles and parts and accessories in the United Kingdom, reports Assistant Trade Commissioner William M. Park in a report from London to the Department of Commerce. This will be accomplished when the so-called McKenna duties, in effect since 1915 and carrying 33⅓ per cent ad valorem c.i.f. duties, are dropped as proposed in the budget for 1924-1925.

The principal result of the repeal of this tariff barrier should be the reduction in price of American cars in England and Scotland and a commensurate stimulus to their sales. Despite import duties, more than 7,000 passenger cars, 775 motor cycles and parts and accessories were shipped to the United Kingdom last year, totaling $4,916,739.

Standing third among our national passenger car markets in 1923 and seventh among truck markets, the United Kingdom is already a well developed field for American manufacturers. Price reductions are certain on imported cars; in fact, a number of makers are now offering a refund of the entire difference between the present price and the price effective Aug. 1. Importers of American cars are thus optimistic and are expecting their business to increase anywhere from one-third to three-fourths when the duties are repealed. Nevertheless, it is believed that no sweeping cuts in selling price can be made, since a portion of the duty saved will be used to equalize the close shaving of profits during the past, as well as to expand advertising and sales work on broader lines.

### The British Version

From a domestic standpoint, removal of the McKenna duties will have a very pronounced effect upon the British motor car industry. Following a series of vigorous protests, in which both manufacturing interests and their employees joined, a number of factories curtailed production, motor car shares were depressed on the stock market and public buying was slowed up by reason of the general uncertainty. Acceptance by the public of the Government's decision to remove the McKenna duties and the consequent removal of uncertainty regarding the situation, has been reflected in an increased demand for cars. Many of the light car builders stated early in June that trade with them had never been better and that the demand was well sustained. One or two companies have recently announced reduced prices and there is little doubt that others will follow as soon as conditions permit or it is proved that such reductions are imperative to hold the business.

The dropping of the tariff barrier will improve the chances of other manufacturing countries where fluctuating exchange does not act as a deterrent in the expansion of their foreign markets.

All in all, it is the opinion among more conservative authorities that the adverse effects of removal of the McKenna duties have been greatly exaggerated. Some of the smaller domestic companies may be forced out of business or into amalgamations with stronger concerns, but since it has long been argued that there are too many motor car manufacturers in Great Britain, this combination of interests may be found the one effective method of placing the industry on a firm foundation. The British market is a rising one and capable of much greater expansion. A large potential demand exists for cheaper cars, and the dropping of the tariff barrier will open up means of satisfying this demand and will doubtless have a beneficial effect upon motor transport as a whole.

The popularity of American automotive products is unquestioned and their low prices give them further preference. Future prospects for increased trade may therefore be regarded as brighter than at any other time since the inception of the motor industry.

Very little, if any, change is expected by the London trade in American motor truck sales, since they have never been subjected to import duties.

## General Electric Gets Detroit Order

The largest order of automatic substation equipment ever placed in the United States has just been contracted for by the Department of Street Railways of the City of Detroit with the General Electric Co. The order calls for a total of ten 2,000-kw. and four 1,000-kw. single unit stations, aggregating 24,000 kw.

These proposed sub-stations will greatly increase the facilities for efficient service on Detroit's street railway system. Both semi-outdoor and indoor type sub-stations are to be used, but all of the transformers will be of the outdoor type.

Delivery of the apparatus will be arranged to fit in with the building requirements of the city and will extend to October, 1926. The capacity and location of these new sub-stations has been selected to fit in with the present feeder system supplying the city railway line. All the sub-stations will operate from 24,000-volt, three-phase 60-cycle supply.

The equipment included in this order comprises standard 2,000 kw. synchronous converters for ten of the stations and standard 1,000 kw. machines for the other four. The apparatus includes high reactance type oil-cooled, single-phase transformers with 24,000-volt primary, automatic switching equipment, outdoor type oxide film lightning arresters, oil circuit breakers for the incoming lines and high speed circuit breakers for the protection of each station. The converters are to be equipped with standard G-H flash barriers and the stations will be fully automatic, including reclosing feeders.

## France May Receive Russian Trade

The outstanding fact of the advent of the new government in power in France is a disposition for industrial and political peace. Once again there is recorded, as a result of the first five months of import and export trade, a remarkable increase over the same period of the previous year. Exports of fabricated articles for the period of 1924 were nearly eleven billion francs, an increase of virtually five billion francs. Imports of the same commodities reached only two billion francs, an increase of but 12 per cent over the year before. It looks promising and would be if the franc was the standard by which one should judge, but the franc has depreciated in the interval from twenty-five to thirty per cent.

The new Herriot cabinet is likely to bring about a rapprochement with Russia of the Soviets, in which case French trade will take a bound in that direction. This refers especially to metallurgical products in both semi-raw and fabricated condition. If there is to be an understanding with the United States with regard to French recognition of Russia and its attendant trade development, it would be well that America should see that her prospective interests of the future were not discounted. Possibly the American farmer does not seek to sell wheat in France, possibly American oil interests and machine tool interests look for nothing more than that which they have so well in hand in France, but Russia's offering will be petrol and wheat on one side and France will naturally expect to liquidate as much of this account as possible by manufacturers, if not locomotives and motor trucks at least many minor metal fabrication and semi-raw materials.

Most of the French metal industries are well garnished with orders, and prospects are considered good for an increased business in the early autumn.

## Austrian Iron and Steel Production

Iron and steel produced by the Alpine Montangesellschaft during June as cabled to the Department of Commerce from Assistant Trade Commissioner E. M. Zwickel, Vienna, was as follows: Iron ore 88,000 metric tons, compared with 96,000 May; pig iron 24,000, a decrease from 32,000 in May; steel ingots 20,000 against 29,000 the previous month; miscellaneous rolled products, 14,000 compared with 23,000 in the previous month. Unfilled orders on hand at the end of June amounted to 20,000 tons, while those for the month prior totaled 30,000 tons. Prices remain at the levels previously established.

# Doubts that Hoover Would Join Council for Metric Standardization

### *Metric Council sends invitation to Commerce Secretary*

It is safe to say that Secretary Hoover has no thought of accepting the invitation of the World Metric Standardization Council to become the leader in the movement which is to free Americans forever "from the bondage of the outworn weights and measures of antiquity." The Secretary of Commerce is in California and has not seen the long letter which recently was addressed to him by Aubrey Drury, of the Council, but his position on the metric system is well known. He does not dispute that some advantages might come were all peoples to use the same system of weights and measures. If asked he probably would agree that ambitious statisticians could arrive at imposing totals that could be saved were the world to use a universal language. He is thought to be of the opinion that the metric system and so called reforms of that character must advance by a gradual demonstration of any merit they may possess. Their worth must be demonstrated by the slow process of appealing first to one line of endeavor and then to another, rather than being imposed by legislative action upon all of the industries.

The excuse for Mr. Drury's letter was had in the statement sent by Secretary Hoover to be read before the Boston meeting of the American Engineering Standards Committee. It is very apparent from the statement itself that Mr. Hoover had no thought of the metric system when he composed this message to the committee:

"It may well be set forth as a truism that it is impossible to maintain proper standards of ethical conduct throughout business and industry without a proper background of recognized physical standards—standards of quality and quantity. Much of the misunderstanding and ill feeling arising in the course of transactions between producers and consumers can be eliminated by the introduction of standards agreed upon as the basis for the interchange of commodities.

"What is true of transactions between individuals within a certain country is true in even a larger measure when commodities produced in one ground are delivered for consumption in another country In order that international good-will may be maintained, and the interests of the individuals and the public safeguarded, it is necessary to establish standards of quality and quantity of such commodities as enter into international trade.

"It is for the purpose of drawing into closer relationship the countries comprising the Pan American Union that plans are now being laid for establishing international American standards."

# Morse Vindicated in Lumber Trial

E. C. Morse, former vice-president of the Triumph Electric Co. of Cincinnati, and War Department Director of Sales under Secretary of War Baker, was completely vindicated recently in the Federal Court in connection with charges made in the so-called war fraud lumber conspiracy case. Federal Judge Bailey overruled the plea of John J. Parker, special assistant to the Attorney-General, to submit the indictment against Mr. Morse to the jury. Without hearing reply from Morse's counsel to the government's argument, Judge Bailey ruled that the prosecution's own evidence was such that no reasonable man could find any justification for the charges against Mr. Morse. The Court held that the evidence clearly shows that in connection with the contract for the sale of surplus lumber to Philips and Stephens, lumber men who are also on trial, Morse had throughout acted for the best interests of the Government.

This is the second time during the past six months that Federal Courts have held baseless charges made against Morse's conduct while in the office of Director of Sales. Last January in the United States Court in West Virginia Federal Judge Groner denounced as "monstrous" an indictment which the Department of Justice had brought against Morse and officials of the United States Harness Co. in connection with the disposal of the huge quantity of military harness which the Government had left after the conclusion of the World War.

At the present trial former Government officials testified that under Morse's direction as chief of the Sales Division of the War Department thousands of contracts for the sale of left-over war supplies were executed. It was shown that materials which had cost the Government $1,600,000,000 during the war were disposed of, under Morse's supervision in 1919 and 1920, with a recovery to the Government of $1,250,000,000. Former Secretary of War Baker, at the Harness trial, and C. Willing Hare, who was succeeded by Morse as Director of Sales, as a witness at the lumber trial, testified that the task of the Director of Sales was a tremendous one. Witnesses showed that hundreds of thousands of different commodities had to be disposed of under Morse's supervision under a policy which sought to obtain the best returns for the Government, and at the same time prevent "dumping" of supplies so as to avoid demoralizing markets. It was shown that Morse received the Distinguished Service Medal when he retired from the War Department and that after searching Congressional investigations charges were made against his conduct of the sales bureau in only three of the thousands of transactions he conducted. None of the charges has been sustained. Judge Groner in the Harness case and Judge Bailey in the Lumber case both emphasized the fact that the Government not only did not show, but did not even claim, that Morse had profited from any of the transactions.

# Ericsson Tablet Will Be Unveiled July 31

On the 121st anniversary of the birth of Captain John Ericsson, Thursday, July 31, at 2 p.m., there will be unveiled with appropriate ceremonies in which representatives of the Federal, State, and Municipal governments will participate, a bronze tablet by Anton Schaff, well known sculptor of this city, at 95 Franklin St., New York, which was the residence of Ericsson when in 1862 he designed and superintended the construction in 100 working days contract time of the iron clad Monitor which turned the tide of the Civil War in her battle with the Merrimac.

The tablet is being erected by the families of three men whose faces with Captain Ericsson's are depicted on it. These men were: Cornelius S. Bushnell of New Haven, Conn, and John F. Winslow and John A. Griswold of Troy, N. Y., who secured the contract from the government and furnished the funds and supplied the materials to build the vessel. The flag to be used in the unveiling is the one which floated on the Monitor during the battle and was draped over the body of Captain Ericsson when it was transported to Sweden in 1890 on the U. S. S. Baltimore by Admiral Winfield Scott Schley.

# Nash Forms Company for Mitchell Plant

Formation of the Ajax Motors Co., a corporation to be located and have its place of business in Racine, Wis., is announced by C. W. Nash. The incorporators are C. W. Nash, W. H. Alford and J. T. Wilson and, according to articles filed with the secretary of state at Madison, the organization has a capital of $3,000,000 of 7 per cent cumulative, preferred stock and 30,000 shares of common stock of no par value.

The preferred shares are callable at par and accrued dividends on any dividend day. Both classes of stock have equal voting power. The following statement was made by Nash regarding the new organization:

"The Ajax Motors Co. of Racine is organized so that it may take over the title to the manufacturing plant and property formerly belonging to the Mitchell Motors Co., and conduct such business as may be established there in the future. The company will be a subsidiary of the Nash Motors Co. The stock of the new company when issued, will be subscribed for and taken over by the parent company. This is a step in the way of the development of the business at Racine."

# The Business Barometer

## *This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments*

**By Theodore H. Price**

Editor, *Commerce and Finance*, New York

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WHEAT, corn, rye, oats, hog products, cotton, coffee and rubber are all higher. Sugar is about the only commodity dealt in for future delivery that has not advanced, but it has not declined appreciably. There are indications that it will soon join in the march toward better prices.

A movement so general must be the result of some common and underlying influence. Just now that influence is cheap money due to our plethora of gold. It seems likely to persist, for there is not the slightest indication of higher rates or credit contraction. The weekly statement of the Federal Reserve Banks confirms this view. It shows an increase of $17,000,000 in the gold held and a reduction of $10,000,000 in earnings assets, which are now less than one-sixth of the total resources.

But in the case of specific commodities specific causes for the advances registered are to be discerned. Wheat is up because it is alleged that the Canadian crop is cut in half. Corn is higher because high temperatures threaten a further curtailment in the yield. Hog products have advanced because less corn means fewer pigs. Rye and oats are described as "sympathetic" with the general bullishness. Hot winds and high temperatures have lifted cotton.

The revolution in Sao Paulo has put coffee up because it may stop shipments to Europe and the United States, and rubber is about three cents higher because consumers have found that there is but little for sale when they try to buy.

From this brief conspectus it will be seen that the markets have shown an increased if not an acute susceptibility to developments that are stimulating. This is due to a change in the psychology of the business mind. With the nomination of John W. Davis men ceased to be fearful of the political future and they have been reassured by the advance in wheat, corn and cotton because they think it will kill the third party movement of which some were apprehensive.

In a situation where the fundamentals of credit and political conservatism are thus buttressed there is but little to create doubt of the future and most merchants are now prepared to ring the jingle bell and go full steam ahead for the next few months. Therefore it is not surprising to receive better reports from the wholesale trade or to read that there is an improved demand for most staple fabrics, including both cotton cloth and woolen goods.

Even in the steel industry there are more signs of life. Scrap iron is higher and a slight increase in the demand for fabricated steel is noted. Copper is, however, still quiescent although stocks have fallen so low that an advance seems almost inevitable if there is any enlargement of the demand. Petroleum and gasoline are lower on the increase in the production but no one seems especially sorry for the poor oil men and their losses are assumed to be the public's gain.

### *What's Doing in Industry*

**Business improved slightly during the past week in the machinery and machine tool industries and the outlook in all parts of the country is considerably better than it has been for more than a month. Inquiries have increased in number. Japanese buying as well as some railroad buying helped to make the week better.**

**Iron and steel production is still off this week from expectations but part of this is seasonal and improvement is expected when the warm weather is over.**

**Automobile production does not show up badly for the first six months of the year. Figures show an output of 2,002,084 cars for the first six months as compared with 2,031,093 for the first half of 1923. June production, however, was off considerably. Prospects are for an early resumption of work in the factories and a general improvement in the industry.**

**Railroad securities have done remarkably well in Wall Street, many issues reaching new highs, while the rest of the market has been irregular but with a generally improved tone.**

**The commodity markets have been the feature of the week with wheat, corn and other grains rising to substantial heights.**

**Business generally has been good for the first six months of the year with June being the poorest month of the six. Steady improvement from now on is the prediction of business men.**

But it is on the Stock Exchange and in the security markets that the effect of the mental change noted is chiefly apparent. Most railroad stocks are higher as are the public utility issues. In so far as the railroad shares are concerned the advance is chiefly due to the talk of consolidations that are provided for in the Esch-Cummins bill.

The Van Sweringens are said to have bought the Pere Marquette and it is believed that other important combinations have been considered at a confidential conference of railway executives held in New York during the past week.

So many moves are possible on the railway checker board that almost any story can be given plausibility and from now on the market for railway stocks is likely to be sharply swayed by rumor. The advance in public utilities is mainly due to the marvelous increase in the use of electricity and here again the improbable can be given an air of plausibility if one has the gift of imagination.

In Europe the conference of the Allied Premiers has begun auspiciously and it is hoped that the result may be an agreement under which the proposed German loan can be issued. If this hope is realized an economic renaissance abroad will probably follow and the stage on both sides the Atlantic will be set for one of the most all embracing business revivals that history has ever recorded.

This eventuality is so clearly indicated that one is almost persuaded to advise caution in reckoning upon the good times that appear to be so plainly in view. But there is really nothing in sight to warrant doubt and for the present at least it will be well to go with the tide.

The figures of our foreign trade for June show an excess of exports worth $30,000,000 and gold imports of about $25,000,000. From this it is argued that Europe is settling her trade balance in cash.

The British profess to be alarmed by the continued shipments of gold to this country and some English financiers are urging an advance in the Bank rate at London as a means of checking the golden outflow and bringing the pound sterling back to par.

Those who oppose this proposal insist that the situation will cure itself through a rise in American prices brought about as a consequence of our abnormal gold supplies.

# The Industrial Review

## *Progress of the machinery and machine-tool business in various parts of the country*

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

### Cincinnati

There is not much activity in the Cincinnati machine tool market at the present time. A survey of the various plants locally reveals that they are running about forty per cent of their normal capacity. Sales in the past two weeks, however, compare favorably with those during June and it looks as though the volume of production for the entire month of July will be on a par with and, in some instances, surpass that in June. This is considered to be a favorable sign, and executives in the industry are inclined to be optimistic about early fall business.

There have been sales of machine tools to railroads lately and these have mounted into substantial figures. Railroads have not been in the market buying as heavily as many of the sales executives had expected, but there have been several orders placed in the past ten days that are encouraging. Lists have been out for some time in the case of several railroads and machine tools houses are counting upon the closing of good orders on these in the near future. In the automotive field the manufacturers of cars have been cautious in their buying. They are watching their production closely and, in doing this, they have kept a watchful eye on their expenditures for machine tools. The general industrial field has not been productive of a great deal of business for local machine tools houses this month.

In the electrical tool field sales have been fairly good for this time of the year. Aggressive sales policies on the part of certain concerns have materially assisted in holding up business to a satisfactory figure.

The used machinery market is in fairly good shape with business mostly on small tools.

There has been but little change in the employment situation. Both skilled and unskilled labor is still plentiful.

### Cleveland

Better feeling in the machinery trade in the Cleveland district is evident during the past week. This is not based upon any actual new business that is coming forward, but rather upon the brighter prospects that have been stirred up by more consistent effort in that direction by the men in the industry.

This, in brief, indicates that with the resumption of activity, industrial operations will need more new equipment, especially of the heavy type.

The automatic field has been circularized by some dealers and special bulletins on multi-spindle machines, for example, have brought a quickening interest that hitherto had not shown itself.

Steel mills and plants, which had shut down at the beginning of the month, are resuming operations. The building situation is improving as the season advances, and in this connection beneficial returns are experienced by the lighter metal working machinery makers and distributors.

The Cleveland Worm & Gear Co. plans to erect a new plant to replace its present factory. This project will cost $200,000 and will include an exceptional machine shop. The new plant will permit twice the capacity of the present factory.

### New York

Lists recently put out for machine tools for the Japanese government were closed this week in the New York markets with the exception of a few tools of a minor nature. Southern railroads, notably the Norfolk & Western, and one of the big electric companies were buyers this week for small lists of machine tools. Some small buying from the automotive industry was also recorded.

The above paragraph represents the actual business in the New York territory. What the future holds is another story, according to dealers. Buying is anticipated no later than the middle of August and both the railroads and the automobile makers are expected to be the customers. Locomotive builders, too, are mentioned as potential purchasers.

The volume of inquiries has increased slightly over May and June and this presages an increase in business in August and later. Business generally is better than it has been in two months and the improvement will eventually be reflected in the machine tool industry. It is believed that the worst of the bad period is passed.

### Buffalo

The American Kardex Co. of Tonawanda is very busy at this time. The new addition to the plant is completed and machinery is being moved in. Although most of the orders have been placed, the company has still to buy a few presses, shears and other equipment.

The Niagara Tool & Machine Works reports that several good prospects are in the field and some of these will be closing orders very shortly.

The end of the season for buying road-building and general building equipment seems to be in sight and this business has begun to taper off.

Most of the machinery offices of the territory report a spotty business, one or two encouraging weeks followed by a duller than usual period, but the concensus of opinion seems to be that early fall will show a much bettered condition and active inquiry.

Plants manufacturing machinery of various kinds are generally running rather light but holding organizations together in the confident hope that there will be a livening of business by September.

### Detroit

Resumption of manufacturing activities on a larger scale by some of the motor plants, accessory factories and metal-working establishments has featured the past week in Detroit's industrial realm and has lent color to the belief held steadfastly by leaders in the machine tool and machinery fields that the outlook for fall business is better than has been anticipated at any time in the past few weeks.

The usual run of inquiries are being directed at machine tool firms, and salesmen report extensive orders in some quarters.

Chiefly responsible for the increased activity in the machinery line is the better outlook in the automotive field. Sales and production figures for the first six months of 1924 compare favorably with any previous years with most of the leading manufacturers.

Employment figures show a material increase in Detroit and its environs. The central foundry of the Saginaw Products Co., Saginaw Division of the General Motors Corp., resumed operations Monday with 450 men back on the payroll and prospects for a greater number within 30 days. The Auto Body Co. of Detroit which closed July 1 has recalled many of its employees following receipt of releases for Star bodies from the Durant company.

### Philadelphia

Relief from the industrial lull that has been manifest for some time was believed by Philadelphia machinery manufacturers and machine tool producers to be in sight this week. Many of the largest producers declare the situation at this time is most encouraging. Their hope is based not only on a well distributed list of inquiries, but upon actual orders for machine tools and other equipment.

The railroads are not yet in the field for any extensive buying, although some orders have been received. The forecast made some months ago that the late summer would witness a break-up in the stagnant condition appears now to be justified. The general industrial situation in most lines, with the possible exception of textile machinery, appears to be one of hopefulness.

Upward of $17,000,000 is involved in two public contracts awarded this week. The City of Philadelphia has given the Keystone State Construction Co. the contract for building the first unit of the new subway system, and a contract for the steel approaches to the new Delaware River Bridge went to the American Bridge Co. for upward of $3,000,000. The subway work will cost more than $14,000,000. These jobs are contributions to the general industrial improvement, some of the benefits from which will fall to the machinery business.

Woodworking machinery dealers and manufacturers report a fair volume of business, and repair business has increased. The automobile sales are not yet up to what they normally are, and auto truck manufacturers say that their product is not selling as it would if normal conditions prevailed.

Machinery used in the building trades is not in as heavy demand as it was a year ago. Sales of used machinery also are off, reports from Philadelphia dealers show.

## News of the Automotive Industry

June production of automobiles reached 249,868, which was twenty per cent less than the May production. For the first six months of the year, there were made 2,002,084 automobiles as compared with 2,031,093 during the first six months of 1923. In June, 1923, there were manufactured 378,575 cars.

The earnings of Mack Trucks, Inc., for the first half of the year is estimated at $3,500,000, which compares with four millions earned during the first half of 1923 and with $1,570,000 during the first six months of 1922.

All directors of the Moon Motor Car Co. were re-elected at the annual meeting of stockholders recently held.

The office of chairman of the board of Dodge Brothers, Inc., was abolished at the annual meeting. The office was held by Howard B. Bloomer who retires from the company. Russell Huff, for nearly ten years chief engineer of the company, has been made a director.

### Willys Makes New Sales Record in June

A new sales record was made by the Willys-Overland Co., Toledo, in June. Dealers' reports show 21,156 Overlands and Willys-Knights sold, which is the highest for any single month.

The Reo Motor Car Co., Lansing, has recalled four thousand employees who have been on a vacation for two weeks. The full force that will be at work after July 21 will be five thousand men.

The Jordan Motor Car Co., Cleveland, shows sales to the amount of $6,578,672 for the first six months of the year.

To facilitate an increased production schedule, the Oshkosh Motor Truck Co., of Oshkosh, Wis., at a meeting of stockholders, voted to increase the working capital by $200,000, practically all of which was subscribed. Business volume in the first six months of 1924 greatly exceeded that of any similar period since the concern was organized.

## Decreases Shown by June Employment Figures

Employment in manufacturing industries decreased 3.8 per cent in June; payroll totals decrease 6.7 per cent; and per capita earnings decrease 3 per cent. These unweighted preliminary figures, presented by the United States Department of Labor through the Bureau of Labor Statistics, are based on reports from 8,627 establishments in 52 industries covering 2,524,657 employees whose total earnings in one week in June were $63,892,615. The same establishments in May reported 2,624,141 employees and total pay rolls of $68,460,342.

### Geographical Divisions

The greatest decrease both in employment and in pay-roll totals is shown in the East-North-Central Geographic Division as was the case in May. The decreases in June were 6.8 per cent in employment and 10.6 per cent in pay-roll totals. The New England Division lost 2.9 per cent of its employees, and earnings decreased 6.7 per cent; in the Middle-Atlantic Division employment decreased 2.3 per cent and pay-roll totals 4.7 per cent; in the West-North-Central Division employment decreased 1.8 per cent and pay-roll totals 1.6 per cent; in the South Atlantic Division employment decreased 2.2 per cent and pay-roll totals 5.1 per cent; in the East-South-Central Division employment decrease 2.5 per cent and pay-roll totals 5.2 per cent; in the West South Central Division employment decreased 3.5 per cent and pay-roll totals 2.8 per cent; and in the Pacific Division employment decreased 1.9 per cent and pay-roll totals decreased 1.1 per cent. As in May, the Mountain Division gained both in employment and earnings.

## Personals

F. E. Meyers, sales manager of the Landis Machine Co., Waynesboro, Pa., will sail for South America next month on a business trip.

Herman J. Breitenbach has been appointed assistant general manager of the Lodge & Shipley Machine Tool Co., Cincinnati.

J. F. Buhr has opened an office in the Blodgett Engineering & Tool Co. Bldg., at 14th and Dalzelle Sts., Detroit, Mich.

F. E. Brown, a director of David Brown & Sons, Ltd., of Huddersfield, Eng., is visiting industrial centers in the United States and Canada.

E. C. Morse has resigned as vice-president in charge of sales of the Triumph Electric Co., Cincinnati.

Fred R. Low, president of the American Society of Mechanical Engineers, has been made an honorary member of the Institute of Mechanical Engineers, London. Mr. Low is at the present in England attending meetings held in connection with the British Empire Exhibition.

William O. Forman, assistant mechanical superintendent of the Boston & Maine railroad, has been made mechanical superintendent succeeding Charles H. Wiggin. His headquarters will be in Boston.

H. J. Swanson has resigned as general sales manager of the Peerless Machine Co., Racine, Wis., and will become the vice-president and treasurer of the Detroit Piston Pin & Manufacturing Co., Detroit, Mich. He was formerly with the Detroit Machine Tool Co.

Bertwell C. Root has been appointed sales manager of the Carthage Machine Co. of Canada, Belleville, Ont.

Fred Albrecht has been appointed general sales manager of the Lodge & Shipley Machine Tool Co., Cincinnati.

R. W. Hobart has been placed in charge of motor sales for the Triumph Electric Co., Cincinnati.

Samuel Vauclain, president of the Baldwin Locomotive Works, is planning trips to Cuba, South America and to Roumania.

R. J. Young has been appointed general sales manager of the Canadian Car & Foundry Co., Montreal, succeeding D. R. Arnold.

R. C. Hayes has been appointed sales manager for the Triumph Ice Machine Co. Division of the Triumph Electric Co., Cincinnati.

Frank G. Drew has been made president of the Winchester Repeating Arms Co., New Haven, Conn., succeeding John E. Otterson, resigned.

Thomas B. Myers, vice-president and general manager of the Hamilton-Beach Manufacturing Co., Racine, Wis., and also assistant secretary of the Scovill Manufacturing Co., Waterbury, Conn., has been elected a member of the board of directors of the Manufacturers National Bank of Racine.

Charles H. Wiggin, mechanical superintendent of the Boston & Maine railroad with headquarters in Boston, is now consulting mechanical engineer with headquarters at the same city. He has been with the road for 42 years and the change was made at his own request for less arduous duties.

E. H. Van Wey, representative of the Ideal Concrete Machinery Co., Cincinnati, is now located in Toledo, with offices at 602 Spitzer Building. Mr. Van Wey formerly made headquarters in Detroit at 1003 Smith Building.

James B. Giern, formerly of the Giern & Anholtt Tool Works but of late with the Standard Service Tool Co., has severed his connections with the latter, of which concern he was vice-president and general manager. Mr. Giern is a pioneer in the designing and manufacturing of automobile service station equipment and tools.

Clinton D. Youngs, for twenty-one years vice-president and manager of the Fenn Manufacturing Co. of Charlotte, Mich., recently disposed of his holdings and moved to Orlando, Florida, where he has acquired an interest in the Orlando Credit Association.

# Business Items

The J. F. Buhr Machine Tool Co. will act as sales representative for the Blodgett Engineering & Tool Co. in Detroit.

W. F. Hebard & Co., 551 W. Van Buren St., Chicago, are the Chicago representatives for the Gibb Instrument Co., Bay City, Mich.

The Strom Ball Bearing Manufacturing Co., Chicago, has opened a distributing station at 2322 S. Michigan Ave., Chicago.

The Hendey Machine Co., Torrington, Conn., has moved its Chicago headquarters to suite 700-702 Sharpless Building, Chicago.

Mitsubishi Shoji Kaisha, Ltd., Tokyo, Japan, have been made exclusive agents for the Empire of Japan, Formosa, Korea, Manchuria and Shantung, for Norton grinding machines, manufactured by the Norton Co., Worcester, Mass. Mitsubishi Shoji Kaisha, Ltd., have a New York office at 120 Broadway.

The plant of the Rivett Lathe & Grinder Co., Boston, Mass., will be closed from Aug. 16 to Sept. 2 for the annual vacation period. The office and shipping department will be kept open. Heretofore all departments have been running full time and the opening in September will be on a full time basis.

The Baldwin Locomotive Works, Eddystone, Pa., has purchased the plant and equipment of the Tindel-Morris Steel Co., Eddystone. The plant adjoins the Baldwin works and the sales price is estimated at $250,000.

The two Anderson, Ind., factories of the Remy Electric Co., division of the General Motors Corp., resumed operations recently with more than 3,000 employees after a vacation of two weeks in some departments and three in others. I. J. Reuter, general manager of the plants, has assumed charge of the Klaxon horn division of the General Motors.

Advices from the Caldwell Screw Co., 7145 Ridgeland Ave., Chicago, are to the effect that no decision has as yet been made with regard to the permanent location of its proposed new plant. The company a short time ago made inquiry of business men's associations in several cities, including Kenosha, Wis., concerning facilities. The Caldwell Screw Co. is a new organization manufacturing wood screws and lag screws and is now engaged in building most of the machinery required for production purposes. J. A. Arenz is general manager.

The foundry and machine shop of the S. H. Peeks Lumber Mill at East Aurora, N. Y., were destroyed recently when a freight train of twenty cars left the Pennsylvania tracks nearby and crashed through the buildings.

## Truck Show Planned for Chicago

The first Motor Transport Exposition will be staged at the American Exposition Palace in Chicago, October 21-27. Truck manufacturers from all parts of the country are expected to exhibit their products, while considerable space will be allotted for the showing of buses, rail cars, trailers and truck accessories.

The exposition will be the first distinct truck show ever to be held, truck manufacturers in the past having always combined their exhibitions with those of passenger cars and being of more or less secondary importance for that reason. The exposition will be open to all truck manufacturers and a large attendance of motor truck fleet owners and dealers is anticipated.

The purpose of the exhibition is primarily educational. The motor truck has made rapid progress in the transportation field during recent years and efforts will be made to demonstrate to the public the results achieved. In addition to the actual exhibition, demonstration space in the rear of the building will be utilized to show the various units in actual operation under operating conditions.

## Bucyrus Company Gets European Orders

President Coleman of the Bucyrus Co., just returned from Europe, says that he booked very substantial and satisfactory orders in Europe. The company has its products placed all over Europe, and the outlook for increased sales in reconstruction work is excellent.

Earnings in the first six months of this year have been ahead of the record profits of the 1923 period. Earnings for the full year 1923 totaled $1,299,932, or $25.49 a share on the 40,000 shares $100 par common.

Plants are operating at capacity, and the outlook is good. The company has no bank loans, and is in strong financial condition.

## Ford Plans Large Plant in England

The Ford Motor Co. has confirmed reports that the company has purchased a 307-acre factory site on the Thames at Dagenhamm, Essex, beyond the east end of London, England.

Original plans called for a factory employing 10,000 workmen and producing 500 cars a day. However, H. S. Jenkins, manager of the English company said this would depend on modification of the present automobile tax of one pound sterling per horsepower.

Jenkins also said abolition of the 33⅓ duty on foreign automobiles would make manufacture of Ford cars in England an uncommercial proposition, but his company would not be deterred on that account.

# Trade Catalogs

**Countershaft Clutch.** The Standard Pulley Co., Cincinnati, Ohio. A small booklet describing the Bacchle Patent countershaft clutch has been issued by this company. Illustrations are also shown of the product.

**Furnace Arches.** The M. A. Hofft Co., 814 West Washington Ave., Indianapolis, Ind. The advantages of the National furnace arches are told in this booklet that has been mailed out. Ease of installation of tiles, separate supports and proper ventilation are stressed.

**Electric Drills.** The Van Dorn Electric Drill Co., Cleveland, Ohio. A folder illustrating and describing the Van Dorn electric drill and cross-section view showing interior construction has been mailed out.

**Turret Lathes.** The Jones & Lamson Machine Co., Springfield, Vermont. "The Problems of Your Shop, Its Work and Equipment," is the title of a booklet that has been issued by this company. It is the first of a series of seven and perhaps more booklets. The other subjects treated will be: bar work, chucking work, controlling overhead, training workers, designing parts for production, and threaded work.

**Power Hammers.** The Blacker Engineering Co., Grand Central Terminal, New York City. Hammers for the forging room and for small stampings are shown in this catalog recently issued. Illustrations show the products at work and the various jobs are enumerated.

**Motors.** The Wagner Electric Corp., St. Louis, Mo. The "Powerful Starterless Polyphase Motor" made by this concern is described and illustrated in detail in a well bound and intelligently compiled booklet.

**Planer Motors.** The Reliance Electric & Engineering Co., Cleveland, Ohio. Heavy duty planer motors for reversing service are shown in this booklet in which the various advantages of the company's product are shown by text and illustration.

**Electric Tramrail.** The Cleveland Crane & Engineering Co., Wickliffe, Ohio. A most complete catalog with illustrations, section drawings, diagrams, specifications and price lists has been issued by this company.

# Forthcoming Meetings

**New Haven Branch of the American Society of Mechanical Engineers.** Fourth annual machine tool exhibit, Sept. 15-18. Mason Laboratory, New Haven, Conn. H. R. Westcott, chairman.

**American Society for Steel Treating.** Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

**Motor and Accessory Manufacturers' Association.** Annual meeting, Cleveland, Ohio, Week of Oct. 6.

**American Foundrymen's Association.** Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

**National Industrial Advertisers Association.** Annual meeting, Edgewater Beach Hotel, Chicago, beginning Oct. 13, 1924.

**Management Week.** Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

**American Gear Manufacturers Association.** Semi-annual fall meeting. Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 16, 17 and 18. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

**American Society of Mechanical Engineers.** Forty-fifth annual meeting. New York City. Dec. 1 to 4. Calvin Rice, secretary, 29 West 39th St., New York City.

**National Exposition of Power and Mechanical Engineering.** Grand Central Palace, New York City, Dec. 1 to 4. Charles F. Roth, 1102 Grand Central Palace Building, New York City.

**Exposition of Invention.** Engineering Societies Building, 29 West 39th St., New York City, Dec. 8 to 13 inc., General offices, 47 West 34th St., New York City.

# The Weekly Price Guide

## *Rise and Fall of the Market*

**Iron and Steel**—Pig-iron buying is still confined to small tonnage lots. Price of No. 2 f'dry iron is about 25c. per ton below level of July 11. Steel price situation is weaker, particularly in cold-drawn and wire products, hoops, bands and sheets. Current mill quotations for the three principal hot rolled products are as follows: bars, $2.15; shapes, $1.95@$2.15 and plates, $1.80@$2.15 per 100 lb., Pittsburgh.

**Non-Ferrous Metals**—Copper firmer; inquiries for heavy tonnages coming into the market. Foreign tin market lower; no declines in domestic prices from level of July 11. Lead stable at present levels, although current price is ⅛ to ¼c. per lb. below July 11. Improve in number of zinc inquiries during week. Antimony in small demand.

(All prices as of July 18)

## IRON AND STEEL

**PIG IRON**—Per gross ton—Quotations compiled by The Matthew Addy Co.:

| | |
|---|---|
| CINCINNATI | |
| No. 2 Southern | $25.05 |
| Northern Basic | 24.00 |
| Southern Ohio No. 2 | 24.00 |
| NEW YORK—Tidewater Delivery | |
| Southern No. 2 (silicon 2.25@2.75) | 28.00 |
| BIRMINGHAM | |
| No. 2 Foundry | 18.00@18.50 |
| PHILADELPHIA | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 24.25 |
| Virginia No. 2 | 28.17 |
| Basic | 24.00 |
| Grey Forge | 24.00 |
| CHICAGO | |
| No. 2 Foundry local | 24.50 |
| No. 2 Foundry, Southern (silicon 2.25@2.75) | 27.00 |
| PITTSBURGH, including freight charge from Valley | |
| No. 2 Foundry | 25.77 |
| Basic | 25.77 |
| Bessemer | 26.77 |

**IRON MACHINERY CASTINGS**—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

| | |
|---|---|
| Detroit | 4.50@4.75 |
| Cleveland | 4.75@5.00 |
| Cincinnati | 5.00@7.50 |
| New York | 5.00@5.50 |
| Chicago | 5.25@5.75 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

| Blue Annealed | Pittsburgh | New York | Cleveland | Chicago |
|---|---|---|---|---|
| No. 10 | $2.75@2.80 | 4.14 | 3.55 | 3.90 |
| No. 12 | 2.85@2.90 | 4.19 | 3.60 | 3.95 |
| No. 14 | 2.95@3.00 | 4.24 | 3.65 | 4.00 |
| No. 16 | 3.15@3.20 | 4.34 | 3.75 | 4.10 |
| Black | | | | |
| Nos. 17 and 21 | 3.50 | 4.55 | 4.25 | 4.55 |
| Nos. 22 and 24 | 3.55 | 4.60 | 4.30 | 4.55 |
| Nos. 25 and 26 | 3.60 | 4.65 | 4.35 | 4.60 |
| No. 28 | 3.65 | 4.75 | 4.45 | 4.70 |
| Galvanized | | | | |
| Nos. 10 and 11 | 3.60@3.80 | 4.80 | .... | 4.60 |
| Nos. 12 and 14 | 3.70@4.90 | 4.90 | .... | 4.70 |
| Nos. 17 and 21 | 4.00@4.20 | 5.20 | .... | 5.00 |
| No. 22 and 24 | 4.15@4.35 | 5.35 | 5.00 | 5.15 |
| No. 26 | 4.30@4.50 | 5.45 | 5.25 | 5.30 |
| No. 28 | 4.60@4.80 | 5.75 | 5.55 | 5.60 |

**WROUGHT PIPE (Welded)**—Warehouse discounts are as follows:

| | New York Black | New York Galv. | Cleveland Black | Cleveland Galv. | Chicago Black | Chicago Galv. |
|---|---|---|---|---|---|---|
| 1 to 3 in. steel butt welded | 48% | 34% | 55½% | 43½% | 50% | 37% |
| 2½ to 6 in. steel lap welded | 44% | 30% | 53½% | 40½% | 47% | 34% |

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

**SEAMLESS STEEL TUBING**—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

| O.D. Inches | List Price per ft. | Differential Discount | O.D. Inches | List Price per ft. | Differential Discount |
|---|---|---|---|---|---|
| ¼ | $0.09 | 50% | ⅞ | $0.16 | 35% |
| ⅜ | .11 | 45% | 1 | .18 | 31% |
| ½ | .14 | 40% | | | |

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

**MISCELLANEOUS**—Warehouse prices in cents per pound in 100-lb. lots:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Open hearth spring steel (base) | 4.50 | 6.00 | 4.20 |
| Spring steel (light) (base) | 7.00 | 6.00 | 6.00 |
| Coppered Bessemer rods (base) | 6.53 | 8.00 | 6.70 |
| Hoop steel | 4.59 | 3.96@4.46 | 4.25 |
| Cold rolled strip steel | 7.50 | 8.25 | 7.15 |
| Floor plates | 5.80 | 5.66 | 5.60 |
| Cold drawn shafting or screw | 4.25 | 4.10 | 3.90 |
| Cold drawn flats, squares | 4.75 | 4.60 | 4.40 |
| Structural shapes (base) | 3.44 | 3.31 | 3.20 |
| Soft steel bars (base) | 3.34 | 3.21 | 3.10 |
| Soft steel bar shapes (base) | 3.34 | 3.21 | 3.10 |
| Soft steel bands (base) | 4.09 | 3.61 | 3.75 |
| Tank plates (base) | 3.44 | 3.31@3.55 | 3.20 |
| Bar iron (3.00 at mill) | 3.34 | 3.21 | 3.10 |
| Tool steel | 11.00 | .... | .... |
| Drill rod (from list) | 60% | 40@55% | 50% |

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

## METALS

Current Prices in Cents Per Pound

| | | | |
|---|---|---|---|
| Copper, electrolytic (up to carlots), New York | 13.12½@13.25 | | |
| Tin, 5-ton lots, New York | 47.00@47.25 | | |
| Lead (up to carlots), St. Louis | 6.70 | New York | 7.50 @7.62½ |
| Zinc (up to carlots), St. Louis | 5.85 | New York | 6.62½@6.75 |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Aluminum, 98 to 99% ingots, 1-15 ton lots | 27.20 | 28.00 | 28.50 |
| Antimony (Chinese), ton spot | 9.25@9.37½ | 10.50 | 10.00 |
| Copper sheets, base | 19.50 | 19.75 | 23.00 |
| Copper wire, base | 15.00 | 17.50 | 16.25 |
| Copper bars, base | 18.75 | 20.75 | 19.50 |
| Copper tubing, base | 21.75 | 25.75 | 23.00 |
| Brass sheets, base | 16.25 | 20.50 | 18.75 |
| Brass tubing, base | 20.50 | 25.50 | 20.50 |
| Brass rods, base | 14.00 | 16.50 | 15.75 |
| Brass wire, base | 16.75 | 20.50 | .... |
| Zinc sheets (casks) | 10.25 | 10.75 | .... |
| Solder (½ and ½), (case lots) | 33.75 | 30.00 | 30.00 |
| Babbitt metal (83% tin) | 60.00 | 58.50 | 48@52 |
| Babbitt metal (35% tin) | 28.00 | 17.50 | 23@26 |
| Nickel (ingot and shot) f.o.b. refinery | 27.00 | .... | .... |
| Nickel (electrolytic) f.o.b. refinery | 30.00 | .... | 35.00 |
| Nickel (F shot) f.o.b. refinery | 30.00 | .... | .... |

**SPECIAL NICKEL AND ALLOYS**—Price in cents per lb., f.o.b Huntington, W. Va.:

| | |
|---|---|
| Rolled nickel sheet (base) | 52.00 |
| Hot rolled rods, Grade "A" (base) | 50.00 |
| Cold drawn rods, Grade "A" (base) | 58.00 |

# Shop Materials and Supplies

## METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54. 00
Manganese nickel hot rolled rods "D"—high manganese (base) 57. 00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

| | | | |
|---|---|---|---|
| Shot | 32. 00 | Hot rolled rods (base) | 40. 00 |
| Blocks | 32. 00 | Cold drawn rods (base) | 48. 00 |
| Ingots | 38. 00 | Hot rolled sheets (base) | 42. 00 |

**OLD METALS**—Dealers' purchasing prices in cents per pound:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper, heavy, and crucible | 10.00@10. 75 | ..... | 9. 50@10. 00 |
| Copper, heavy, and wire | 9. 62½@10. 50 | ..... | 9. 50@10. 00 |
| Copper, light, and bottoms | 8. 50@ 9. 00 | ..... | 8. 00@ 8. 25 |
| Lead, heavy | 5. 62½@6. 00 | ..... | 5. 00@ 5. 50 |
| Lead, tea | 4. 37½@5. 00 | ..... | 3. 00@ 3. 25 |
| Brass, heavy, yellow | 6. 50 | ..... | 6. 00 |
| Brass, heavy, red | 8. 50 @8. 75 | ..... | 7. 50 |
| Brass, light | 5. 75 | ..... | 5. 00 |
| No. 1 yellow brass turnings | 6. 50 @6. 75 | ..... | 6. 00 |
| Zinc | 3. 50 @3. 75 | ..... | 2. 50 |

**TIN PLATES**—American Charcoal—Bright—Per box.

| | | New York | Cleveland | Chicago |
|---|---|---|---|---|
| "AAA" Grade: | | | | |
| IC, | 20x28, 112 sheets | $23. 50 | $22. 85 | $18. 50 |
| "A" Grade: | | | | |
| IC, | 20x28, 112 sheets | 19. 00 | 18. 00 | 17. 00 |
| | Coke Plates—Primes, 20x28 in. | | | |
| 100-lb., | 112 sheets | 13. 00 | 13. 00 | 14. 50 |
| | Terne Plates—Small lots, 8-lb. Coating | | | |
| IC, | 14x20 | 7. 75 | 6. 55 | 7. 40 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb. | $0. 14@0. 21 | $0. 20 | $0. 14 |
| Cotton waste, colored, per lb. | . 09@ .12½ | .17 | . 10½ |
| Wiping cloths, 13½x13½, per lb | 11. 25* | 36. 00 per M | . 16 |
| Wiping cloths, 13½x20½, per lb. | .... | 52. 00 per M | . 16 |
| Sal soda, per 100 lb. | 2. 40 | 2. 25 | 2. 65 |
| Roll sulphur, per 100 lb. | 3. 60 | 3. 25 | 3. 50 |
| Linseed oil, per gal., 5 bbl. lots | 1. 03 | 1. 09 | 1. 05 |
| Lard cutting oil, 25% lard, per gal. | . 55 | . 50 | . 79† |
| Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal. | .29 | . 35 | . 214 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls). | | | |
| Leather—List price, 24c. per lin. ft. per inch of width for single ply. | | | |
| Medium grade | 40–2½% | 30–10% | 30–10% |
| Heavy grade | 30–5% | 30% | 20–5–2½% |
| Rubber transmission: | | | |
| First grade | 50% | 50–10% | 40–10% |
| Second grade | 50–10% | 60–5% | 60–5% |
| Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets: | | | |
| Flint paper | $5. 40 | $5. 84 | $6. 48 |
| Emery paper | 9. 90 | 11. 00 | 8. 80 |
| Emery cloth | 31. 12 | 31. 12 | 29. 48 |
| Emery disks, 6 in. dia., No. 1 grade, per 100: | | | |
| Paper | 1. 49 | 1. 24 | 1. 40 |
| Cloth | 3. 38 | 2. 67 | 3 20 |
| Fire clay, per 100 lb. bag | .. .. | . 65 | . 60 |
| Coke, prompt furnace, Connellsville | per net ton | | 3. 00@3. 25 |
| Coke, prompt foundry, Connellsville | per net ton | | 4. 25@4. 75 |
| White lead, dry or in oil | 100 lb. kegs | | New York, 14. 50 |
| Red lead, dry | 100 lb. kegs | | New York, 14. 50 |
| Red lead, in oil | 100 lb. kegs | | New York, 16. 00 |

*White, at washery.
†Chicago quotes on pure lard oil, No. 1 grade.

## *Comparative Warehouse Prices*

| New York | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.0334 | $0.0349 | $0.0354 |
| Cold finished shafting | per lb. | 0.0425 | 0.044 | 0.044 |
| Brass rods | per lb | 0.14 | 0.145 | 0.18 |
| Solder (½ and ½) | per lb. | 0.3375 | 0.335 | 0.285 |
| Cotton waste | per lb. | .14@.21 | .14@.21 | .10@.13 |
| Washers, cast iron (½ in.) | per 100 lb. | 6.50 | 6.50 | 6.50 |
| Emery, disks, cloth, No. 1, 6 in. dia. | per 100 | 3.38 | 3.38 | 3.38 |
| Lard cutting oil | per gal. | 0.55 | 0.55 | 0.55 |
| Machine oil | per gal. | 0.29 | 0.29 | 0.297 |
| Belting, leather, medium | off list | 40–2½% | 40–2½% | 30–10% |
| Machine bolts up to 1x30 in. | off list | 50% | 50% | 30% |

## SHOP SUPPLIES

Current Discounts from Standard Lists

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Machine Bolts: | | | |
| All sizes up to 1x30 in. | 50% | 60–10–5% | 60% |
| 1½ and 1½x3 in. up to 12 in | 15% | 60% | 60% |
| With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%) | 40% | $3. 50 net | 60% |
| With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%) | 45% | 3. 50 net | 60% |
| Button head bolts, with hex. nuts | 10% | List net | ..... |
| Hex. head and hex. nut bolts | 10% | ..... | ..... |
| Lag screws, coach screws | 50% | ..... | 65% |
| Square and hex. head cap screws | 75% | 75% | ..... |
| Carriage bolts, up to 1 in. x 30 in. | 40% | 60% | 55% |
| Bolt ends, with hot pressed nuts | 50% | ..... | 60% |
| Tap bolts, hex. head, list plus | 35% | ..... | $4.00 off list |
| Semi-finished nuts, ⅝ and smaller | 70% | ..... | ..... |
| Semi-finished nuts, ¾ and larger | 65% | 70% | ..... |
| Case-hardened nuts | 50% | ..... | ..... |
| Washers, cast iron, ½ in., per 100 lb. (net) | $6. 50 | $4. 00 | $3. 75 |
| Washers, cast iron, ¾ in., per 100 lb. (net) | 5. 50 | 4. 00 | 3. 75 |
| Washers, round plate, per 100 lb. Off list | 1. 50 | 4. 50 | .... |
| Nuts, hot pressed, sq., per 100 lb. Off list | 1. 50 | 4. 00 | 4. 00 |
| Nuts, hot pressed, hex., per 100 lb. Off list | 1. 50 | 4 00 | 4. 00 |
| Nuts, cold punched, sq., per 100 lb. Off list | 1. 50 | 4. 00 | 4. 00 |
| Nuts, cold punched, hex., per 100 lb. Off list | 1. 50 | 4 00 | 4. 00 |
| Rivets: | | | |
| Rivets, ⅞ in. dia. and smaller | 50% | 60–10% | 70% |
| Rivets, tinned | 50% | 60–10% | ..... |
| Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net) | $5. 00 | $3. 50 | $3. 65 |
| Cone heads, ditto (net) | 5. 20 | 3. 60 | 3. 85 |
| 1½ to 2-in. long, all diameters, *EXTRA* per 100 lb. | 0. 25 | ..... | 0. 15 |
| ¾ in. diameter *EXTRA* | 0. 35 | ..... | 0. 15 |
| ½ in. diameter *EXTRA* | 0. 75 | ..... | 0. 50 |
| 1 in. long, and shorter *EXTRA* | 0. 75 | ..... | 0. 50 |
| Longer than 5 in. *EXTRA* | 0. 50 | ..... | 0. 25 |
| Less than 200 lb. *EXTRA* | 0. 50 | ..... | 0. 50 |
| Countersunk heads *EXTRA* | 0. 45 | ..... | $4.20 base |

# Machine Requirements and Industrial Construction

## Machine Tools and Equipment Wanted

**Ia., Cedar Rapids**—American Machine Co., P. F. Law, Pres.—vertical attachment for Milwaukee 3 B milling machine (used).

**Ky., Louisville**—Office of United States Engineer, P. O. Box 72—will receive bids until July 28, for one water jet air hammer drill, complete with quarry bar, etc., 3½ in diameter cylinder, 6½ in stoke. 80 to 100 lbs. pressure and three hand air hammer drills; also one circular saw mill with carriage, saws up to 52 in. diameter with two headlogs, opening about 36 in.

**Minn., St. Paul**—Department of Education, City Hall, H. W. Austin, C. P. A.—will receive bids until Aug. 5, for hand planer and joiner, variety saw, band saw, surfacer and mortiser.

**N. J., Newark**—Gilbey Wire & Die Co., 108 Adams St.—wire drawing machinery.

**N. Y., Alden**—A. Y. Bennett Mfg. Co.—machinery for manufacturing steel cabinets.

**N. Y., Aurora**—S. H. Peck & Sons—machinery and equipment for foundry and planing mill.

**N. Y., Buffalo**—A. J. Albano, 170 Sycamore St.—equipment for garage repair shop.

**N. Y., Buffalo**—S. A. Day Manufacturing Co., 1483 Niagara St. — machinery for manufacturing steel products.

**N. Y., Buffalo** — Flierl-Middlteon, Inc., 854 Kensington Ave., machinery for planing mill.

**N. Y., Buffalo**—L. Gerstman, 957 West Delevan Ave.—machinery for manufacturing metal products.

**N. Y., Buffalo**—D. W. Martin, 878 Hertel Ave.—equipment for sheet metal work shop.

**N. Y., Buffalo**—Morrison Metal Products Co., 201 Urban St.—equipment for manufacturing metal products.

**N. Y., Buffalo**—A. G. Tee, 500 Pearl St.—equipment for garage repair shop.

**N. Y., Ellenburgh**—R. Good—Machinery and equipment for planing mill and grist mill.

**N. Y., Gouverneur**—Spooner Campbell Co., Main St.—complete machine tool equipment for garage and machine shop.

**N. Y., Little Falls**—M. Guiney Co., Mary St.—one 18 to 24 in. B. G. Engine lathe, vertical post drill and miller.

**N. Y., Owego**—Owego Bridge & Iron Co., North Ave., additional equipment for foundry.

**O., Canton**—American Sheet & Tin Plate Co., lathes, drill presses, etc. for proposed new machine shop.

**O., Columbus**—E. J. & W. E. Jones, 496 W. Spring St.—molding machine.

**O., Columbus**—Hart & Crouse, (furnace mfgrs.) Henry and Poplar Sts., H. B. Whitman, Genl. Mgr.—metal working machinery.

**Tex., Dallas** — Higginbotham, Bailey Logan Co., 908 Jackson St.—13 in. screw cutting engine lathe.

**Wis., Cudahy**—The Northern Refrigerator Co.—woodworking machinery.

**Wis., Fond du lac**—B. F. & W. L. Sweet Co.—tools and equipment to manufacture trailers, heavy bodies, etc.

**Wis., Oconto**—The Holt Lumber Co.—sawmill, planing and flooring mill machinery, planers, saws, etc., electric motor drive.

**Wis., Racine**—W. Ireland, Route 3, Caledonia—drill press, lathe.

**Wis., Racine**—W. H. Pugh, 559 State St.—coal unloading cranes.

**Wis., Rhinelander** — The Oneida Chuck Co., A. J. Lamoette, Mgr.—machinery and equipment to manufacture chucks, tools, and other mechanical specialties.

**Wis., South Milwaukee**—Spencer & Barrett Auto Co., Milwaukee Ave., boring machine, drill, emery and stand.

**Wis., Stanley**—Stanley Wooden Ware Co., T. Heiting, Purch. Agt.—woodworking machinery including turning lathe.

**N. B., Burtt's Corner**—E. Burtt's Lumber Co.—molding machine and sander.

**N. S., Canso**—H. R. Des Barres—complete equipment for garage and service station.

**Que., Montreal**—W. Brunet, 199 Manufacturers St.—complete equipment for garage and service station.

**Que., Montreal**—The Montreal Hardware Mfg. Co.—automatic butt bending and rolling machine for making light butts 1 in. to 2 in. long.

## Opportunities for Future Business

**Calif., Sacramento** — Moller Auto Sales Co., c/o J. C. Peterson, Archt., Peoples Bank Bldg., is having plans prepared for the construction of a 4 story garage. Estimated cost $150,000.

**Conn., Meriden**—International Silver Co., State St., having plans prepared for the construction of a 3 story, 45x75 ft. factory. Estimated cost $40,000. L. Hamilton, 119 West Main St., Archt.

**Conn., Waterbury**—Plume & Atwood Mfg. Co., 470 Bank St., manufacturers of brass, awarded the contract for the construction of a 4 story 50 x 150 ft. addition to factory. Estimated cost $80,000. Noted Mar. 27.

**Ky., Corbin**—The Louisville & Nashville R. R. Co., 10th St. & Broadway, Louisville plans to build machine and forge shop at Carbin yard. W. H. Courtney, Chf. Engr. Cost to exceed $40,000.

**Ky., Louisville**—H. Pilcher & Sons Co., 908 Mason St., manufacturers of organs, plans to build a 2 story 50 x 150 ft. addition to factory. F. Erhart, Norton Bldg., Architect.

**Mass., Chelsea** (Boston P. O.)—Standard Box Mfg. Co., Gerrish Ave., plans to build a 4 story, 50 x 100 ft. addition to factory. Estimated cost $60,000. S. S. Eisenberg, 46 Cornhill St., Boston, Archt. and Engr.

**Mass., Lynn**—The General Electric Co., West Lynn, awarded the contract for the construction of a garage building. Estimated cost $20,000. This is the first unit of their $90,000. plant addition.

**Mass., Lynn**—D. A. Sheenan, 92 Grant St., plans a 1 story, 35 x 55 ft. machine shop. Private plans.

**Mass., Somerville** — Stevens, Stearns Motor Car Co., 68 Dover St., awarded the contract for the construction of a 2 story 55 x 70 ft. service and repair building. Estimated cost $40,000. Private plans.

**Mass., Springfield**—Haynes Electric Co., 34 Taylor St., awarded the contract for the construction of a 3 story, 50 x 100 ft. repair and storage building. Estimated cost $45,000. H. E. Seckler, 335 St. James Ave., Archt.

**Mich., Detroit**—General Electric Co., 1501 Dime Bank Bldg., awarded the contract for the construction of a 5 story 75 x 200 ft. building for office warehouse and shops, also a 1 story 40 x 186 ft. service shop, on 3rd and Antoinette Sts. Estimated cost $175,000. Private plans.

**Mich., Detroit**—Michigan Copper & Brass Co., 5841 W. Jefferson Ave., will build a 1 story 86x420 ft. factory at 5851 Jefferson Ave. Cost $100,000.

**Mo., St. Louis**—The Eighteenth Street Realty Co., c/o J. Lionberger, 312 North 8th St., is having preliminary plans prepared for the construction of a 4 story, garage building and shops. Estimated cost $1,000,000.

**Mo., St. Louis**—G. Seeley, 4914 Delmar Blvd., will build a 2 story 80 x 170 ft. garage and service building at 5613 Pershing Ave. Estimated cost $150,000. Private plans.

**Mont., Miles City** — State Bd. of Examiners, A. E. McFatridge, Clk., Helena, will soon award the contract for the construction of hospital, kitchen and industrial shops at the State Industrial School here. Estimated cost $150,000. B. Rivenes, Archt.

**O., Canton**—American Sheet & Tin Plate Co., plans to build a 1 story machine shop. Cost to exceed $50,000.

**Pa., Johnstown**—Johnstown School District, Bd. of Directors, J. D. Rutledge, Pres., will receive bids until Aug. 25, for the construction of a 3 story 300x250 ft. high school including vocational shops on Somerset St. Estimated cost $1,000,000. J. E. Adams, Nemo Bldg., and E. L. Tilson.

**Pa., Philadelphia**—Connery & Co., 2nd and Luzerne Sts., boiler manufacturers, will build a 1 story 30 x 78½ ft. metal working shop, on 79th St. and Bartram Ave. Estimated cost $5,500. Private plans.

**Tenn., Knoxville**—The Southern Railway Co., 13th & Pennsylvania Ave., Washington, D. C, awarded a contract for the design and construction of the John Sevier Yard near here, including machine shop to The Foundation Co., 120 Liberty St., New York.

**Tex., Dallas**—B. R. Parks, 517 Jackson St., is receiving bids for the construction of a 1 story 100x216 ft. factory for the manufacture of motor specialities. Estimated cost $40,000. J. A. Pitzinger, S. W. Life Bldg., Archt.

**Tex., Paris**—Cummer Crate Co., plans addition to box factory. Estimated cost $45,000.

**Wis., Cudahy**—Northern Refrigerator Car Co., awarded the contract for the construction of a 1 story 125x227 ft. car shop. Estimated cost $60,000.

**Wis., Milwaukee**—The E. A. Julien, 208 Grand Ave., awarded the contract for the construction of a 1 story, 50x100 ft. brass foundry and machine shop at 1642 Holton St.

**Wis., Shorewood** (Milwaukee P. O.) — School Dist. 4, H. Kuechenmeister, Clk., awarded the contract for the construction of a 2 story manual training shop on Atwater St. Estimated cost $40,000. Noted June 26.